SCIENCE

FRIDAY, MAY 6, 1898.

CONTENTS:

THE NATIONAL ACADEMY OF SCIENCES.

THE annual stated session of the Academy was held in Washington, April 19th to 22d.

The President, Dr. Wolcott Gibbs, presided over all the sessions and thirty-five other members of the Academy were in attendance, as follows:

Messrs. Cleveland Abbe, Alex. Agassiz, Geo. F. Barker, Carl Barus, A. G. Bell, J. S. Billings, W. H. Brewer, W. K. Brooks, Elliott Coues, Wm. H. Dall, Wm. L. Elkin, S. F. Emmons, G. K. Gilbert, Theo. N. Gill, F. A. Gooch, Arnold Hague, Asaph Hall, James Hall, C. S. Hastings, Geo. W. Hill, Alpheus Hyatt, S. P. Langley, O. C. Marsh, T. C. Mendenhall, A. A. Michelson, Simon Newcomb, J. W. Powell, F. W. Putnam, Ira Remsen, H. A. Rowland, C. A. Schott, C. D. Walcott, Wm. H. Welch, C. A. White and A. W. Wright.

The public and business sessions of the Academy were held in the pavilions of the Congressional Library. It was an advantage for members to have a convenient opportunity to examine the magnificent arrangements and decorations of the library, and the place of meeting was preferable to the extemporized quarters in the National Museum. Still the rooms were not very accessible, their acoustical properties were extremely bad, and the temporary character of the arrangements are scarcely befitting a great National Academy. It is curious that Washington, with its immense scientific activity and continuous series of meetings and conventions, should have no suit-

able place for the sessions. In view of the relations of the National Academy to the government, it would seem proper that a building, or at least an auditorium and committee rooms, should be provided for its use. Other societies could then be permitted to occupy them when the Academy was not in session. It is, however, possible that the Washington Academy of Sciences may be able to provide such a building.

The business sessions of the Academy, in accordance with an excellent plan adopted two years ago, were held in the mornings, while the sessions for the reading of scientific papers, to which the public is invited, were in the afternoons. The scientific program was as follows:

I. The Coral Reefs of Fiji, . . A. Agassiz.
II. The Fiji Bololo,
A. Agassiz and W. McM. Woodworth.
III. The Acalephs of Fiji,
A. Agassiz and A. G. Mayer.
IV. The Variation in Virulence of the Colon Bacillus, ... J. S. Billings.
V. Biographical Memoir of Edward D Cope.
Theo. Gill.
VI. New Classification of Nautiloidea,
Alpheus Hyatt.
VII. A New Spectroscope, A. A. Michelson.
VIII. On the Hydrolysis of Acid Amides,
Ira Remsen and E. E. Reid.
IX. The Question of the Existence of Active Oxygen,
Ira Remsen and W. A. Jones.
X. On the Product formed by the Action of Benzenesul-phonchloride on Urea,
Ira Remsen and J. W. Lawson.
XI. On Double Halides containing Organic Bases, ... Ira Remsen.
XII. McCrady's Gymnophthalmata of Charleston Harbor, ... W. K. Brooks.
XIII. Ballistic Galvanometry with a Counter-twisted Torsion System,
Carl Barus.
XIV. A Consideration of the Conditions governing Apparatus for Astronomical Photography, Charles S. Hastings.
XV. The Use of Graphic Methods in Questions of disputed Authorship, with an Application to the Shakespeare-Bacon Controversy, . . T. C. Mendenhall.
XVI. A Method for Obtaining a Photographic Record of Absorption Spectra,
A. W. Wright.
XVII. Theories of Latitude Variation,
H. Y. Benedict.
Presented by A. Hall.
XVIII. Progress in the New Theory of the Moon's Motion, ... E. W. Brown.
Introduced by S. Newcomb.
XIX. On the Variation of Latitude and the Aberration-Constant,
Charles L. Doolittle.
Introduced by S. C. Chandler.
XX. A Curious Inversion in the Wave Mechanism of the Electromagnetic Theory of Light, ... Carl Barus.

Many of the papers were technical in character, and the authors did not attempt to read them in full, but only gave a general outline of the results. Several of the papers were, however, of general interest. Professor Agassiz described in some detail the important results of his recent visit to the islands and coral reefs of the Fiji group. He took with him in the 'Taralla' boring apparatus, but became convinced that the borings made by Professor Sollas and by Professor David on the Atoll of Funafuti do not corroborate the theory of Dana and Darwin—that the atolls and barrier reefs have been formed by the subsidence and disappearance of the central island—but that the great thickness of the coral was merely the base of an ancient reef. Professor Agassiz found, to his surprise, that the Fiji islands are not in an area of subsidence, but, on the contrary, in an area of elevation, reefs being found far above the level of the sea, the elevation amounting to upwards of 800 feet. It was argued that the atolls and reefs can be satisfactorily accounted for by denudation and erosion, in some cases of extinct volcanic craters. In a second paper Professor Agassiz described the sudden appearance of the annelid 'Bololo' at Levuka. It arrives on a certain day in such numbers that the surface of the water resembles thick

vermicelli soup. The eggs and spermatozoa are discharged and nothing is left but empty skins scarcely visible.

Professor Michelson described his important invention of a spectroscope without prisms or gratings made by building up steps of equal thickness of optical glass. With twenty elements 5 mm. thick the resolving power would be 100,000 which is about that of the best gratings. The method is especially important for the examination of single lines and the study of the effects of broadening, shifting or doubling of lines. Dr. Gill read a biographical memoir of Edward D. Cope, based on his address as President of the American Association, which has been published in this JOURNAL. President Mendenhall gave the results of further researches on the lengths of words used by different authors. He is able to show graphically a characteristic curve for a writer, and thus has found a method by which disputed authorship may be tested.

Dr. J. S. Billings resigned the office of Treasurer on account of his removal from Washington, and Mr. Charles D. Walcott was elected in his place. Messrs. Billings, Bowditch, Brush, Hague, Marsh and Newcomb were re-elected additional members of the Council for another year.

No new members of the Academy were elected this year. This appears to be unfortunate, as only thirteen elections have been made during the past eight years, whereas the Academy has lost twenty-eight members by death. The Academy can, by its constitution, only elect five members annually, and as the deaths are likely to amount to nearly this number it is difficult to see how the membership can be maintained if, in certain years, no members are elected, as was the case in 1891, 1893, 1894 and this year.

A large addition was, however, made to the foreign associates of the Academy, whose number is limited to fifty, as follows:

Professor Henri Poincaré, Paris; Dr. David Gill, Cape Town; Lord Rayleigh, London; Professor Adolf von Baeyer, Munich; Lord Lister, London; Professor Edward Suess, Vienna; Professor H. de Lacaze-Duthiers, Paris; Professor Edward Strasburger, Bonn; Professor Felix Klein, Göttingen; Professor Henri Moissan, Paris; Professor Karl Alfred von Zittel, Munich.

The autumn meeting of the Academy will be held at New Haven, beginning on November 15th.

SOME AIDS TO THE STUDY OF STEREOSCOPIC VISION.

THE familiar form which the stereoscope has assumed since Brewster, together with the marked development of photography, has brought about a general appreciation of the striking and frequently beautiful effect which this instrument produces. This form of the apparatus, however convenient, is not best suited to the exposition of the underlying principles of the stereoscopic illusion. These principles involve the general problem of the perception of depth or solidity, and this, in turn, is a rather complicated matter, which involves many details. An important service which the stereoscope performs for the psychologist is the aid which it renders him in the analysis of these factors. Some of the more or less recent variations in the form and construction of stereoscopic instruments furnish added facilities for the demonstration of the factors which enter into the perception of depth. To furnish a brief account of these various aids to the study of stereoscopic vision is the purpose of this article.

One of the most frequently discussed points is the dependence of the appearance of solidity upon the dissimilarity of the two stereoscopic pictures, which, in turn, imitate the differences of the retinal images in the two eyes. The truth of this view can be established be-

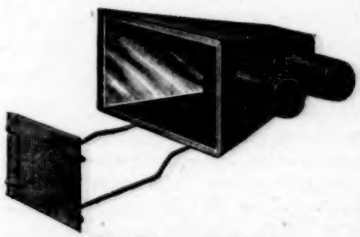
yond any reasonable doubt, and is proved by the fact that all instruments which really produce this appearance of depth, however much they may differ in other respects, must furnish some systematic differences in the two pictures to be viewed. It is evident, however, that this aid to the perception of depth will differ considerably according as the object represented is near or far away. For near objects the differences in the retinal images will be quite marked, while for distant ones the images will be more nearly alike. To magnify the perception of depth in distant views Helmholtz devised the telestereoscope, which acts by practically spreading the distances between the eyes, and which, in combination with lenses, finds a useful application in stereoscopic field glasses. The processes of convergence and accommodation accompany these differences in the retinal images; and these, too, are more active in the perception of near objects than of distant ones. In order to determine which of the two factors, convergence or difference in the retinal images, is the more essential it is necessary to produce one more or less independently of the other. This can be done, first, by viewing in the ordinary stereoscope two views which are precisely alike and which are superimposed by means of convergence; and, again, two views which differ as the two retinal images differ and which are combined with a minimum of convergence by means of devices described further on. The result is unmistakable and shows that convergence is only an added element and that the difference in the retinal images is the all-important factor.

But apart from these factors, which may be expressed in physiological terms—that is, in terms of what goes on on the retina and within the eye and eye-muscles—there are psychological factors in the perception of depth which materially influence the result. While the former are either simple sensations or the inferences from them, the latter involve more complicated forms of interpretation on the basis of perceptions which are the result of a varied experience. First among these is the distribution of light and shade. This factor is so important in most of our experience in the interpretation of depth that it alone frequently determines the visual result and overrules the influence of all other factors. For example, it is not difficult to illuminate an intaglio in such a way that it can be mistaken for a cameo. In the illusion of depth which the artist produces this factor is obviously of supreme importance. A second psychological factor, likewise invaluable to the artist, arises from our constant tendency to interpret outlines and contours as the representations of three-dimensional objects. As a result of our general experience, we are quite prepared to interpret all lines in a painting or an etching or a photograph as representing certain views of objects. We know, of course, that the pictures are flat, but we see them as solid. Especially when this tendency is combined with the interpretation of lights and shadows do we have an appearance of depth which, when skillfully portrayed, seems hardly less real than the reality. A third factor equally operative in pictures and in reality is that summed up in the term perspective, which involves in the main the diminution in the apparent size of the object as its distance from the eye increases. Figures in the foreground and in the background are interpreted not according to their real size—that is, not the number of millimetres that they occupy on the retina, or of inches on the canvas—but according to these as modified by the estimated distance between the object and the point of view of the beholder. The familiarity of objects is, of course, a great aid in the proper estimation of such distances. If two men are represented upon a picture, and the one representation

is one inch in height and the other two inches, we infer (under proper conditions of perspective) not that the one man is twice as tall as the other, but that the two are of approximately similar size, and that the one is considerably more distant. As a further factor one may mention the interrupted view of a more distant object by reason of a nearer object standing in front of it. Most objects are opaque, and on this account we infer the continuity of outlines which are more or less hidden by the objects in the foreground. If, for example, we see in reality or on a picture a bush in front of a fence we do not infer that the fence is broken where the bush prevents us from seeing it, but that it is continuous and farther away than the bush.

When all these factors coöperate they produce a very complete illusion of depth, and frequently one which does not seem to require the operation of the more physiological factors of convergence and the difference in the retinal images. In the case of photographs viewed through the stereoscope we have the combination of all the above factors, and it requires a rather detailed analysis to make clear the influence of each. It is possible, however, to prove conclusively that the difference in the retinal images is the prime factor and that all the others form accessory methods for the inference of depth, but are not at all necessary for this effect. For this purpose we must have stereoscopic views which show no light and shade, no perspective, no interposition of objects. Geometrical figures theoretically constructed have been generally used for this purpose. A very superior series of diagrams has recently been published and forms an important aid to the study of stereoscopic vision. They are the result of the application of the stereoscope to the demonstration of mathematical problems, a result which has been most ingeniously reached by Professor C. S. Slichter,* of the University of Wisconsin. These diagrams represent the motion of a point in space under the influence of three forces acting respectively in the three dimensions of space. A small electric lamp suspended in a dark room is given a pendular motion, and at the same time a stereoscopic camera is itself swung in a direction at right angles to the motion of the lamp. These movements are brought into unison by means of electro-magnets, and the result is that the point of light leaves its trace on the pair of photographic plates precisely as though a pair of eyes were following the movement of the point in and out through the three dimensions of space, but that in addition the track of this point of light is retained from beginning to end. These views thus represent beautiful and intricate mathematical curves and in the stereoscope appear distinctly three-dimensional as wire forms or models. I know of nothing which equals these views in clearness and precision, and I cordially recommend them as test diagrams in stereoscopic experiments. It may be said that any instrument which succeeds in producing from a pair of such views a full and complete appearance of depth is a true stereoscope, and one which fails to do this is not a true and perfect stereoscope.

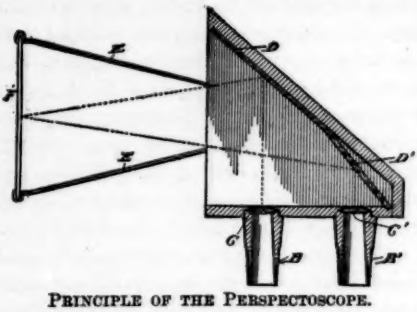
An interesting and novel type of apparatus has recently been introduced under the term of Perspectoscope. It consists in



THE PERSPECTOSCOPE.

* Transactions of the Wisconsin Academy, 1898, Vol. XI., p. 449.

the main of two eye-pieces fitted with suitable lenses and of a pair of mirrors, the two mirrors being set at such an angle that the image from a single picture which is placed at right angles to the eye pieces will be reflected into each of the eyes. The accompanying illustrations will readily make clear the principle. The



PRINCIPLE OF THE PERSPECTOSCOPE.

B. B.'—Viewing tubes. C. C.'—Lenses. D. D.'—Reflectors. E. E.—Picture Holder. F.—Picture.

inventor of this instrument claims that it disproves the accepted theory of the stereoscope, because with it one can see a single picture, such as any ordinary photograph or drawing, in apparent perspective. He further claims that in this way a true perspective is obtained, while the ordinary stereoscope is alleged to exaggerate the perspective.* These claims can be readily disproved; in the first place, the perspectoscope utterly fails to exhibit the test diagrams above described as solid; secondly, the ordinary stereoscope does not as a rule exaggerate the perspective, although such an exaggeration may be readily obtained if desired. In Professor Slichter's diagrams the motion from left to right was in reality equal in extent to the motion forward and backward. I asked a number of persons as they viewed these diagrams to estimate the breadth in terms of the depth, and the general tendency was to regard the diagram as somewhat broader than deep. Although the claims made for the perspectoscope cannot be allowed, it is true that when a photograph is viewed by the average observer in the perspectoscope there is a striking appearance of depth, quite enough to make this apparatus a popular instrument for viewing pictures. How is this effect of apparent depth produced? The answer is in the main that the accessory factors in the perception of depth are here introduced at their maximum efficiency; and added to this there is the action of the lenses in magnifying the objects, and the convenience and precision with which the views as reflected from the two mirrors may be superimposed. It is a well-known fact that a large magnifying glass is itself an important aid in the perception of the third dimension in a photograph, and this aid is utilized in the perspectoscope in a more convenient form. For the same reason the glasses in the ordinary stereoscope are not prisms but prismatic lenses.

To one who is familiar with the appearance in the stereoscope of a pair of stereoscopic views (or stereographs, as Le Conte Stevens suggests) there is something decidedly lacking in the perspectoscope effect; and yet, unless the two are viewed immediately in succession, the average observer might well be misled to regard the perspectoscope as really producing the appearance of depth. This is altogether likely to be the case if the observer happens to use stereographs which are not well made. Unfortunately, a very large proportion of the views commonly sold are far from perfect, and a considerable part of a dealer's entire stock which I recently examined was made up of views which were not stereo-

*He also argues that the perspectoscope obviates the necessity of extreme convergence as the eyes assume a natural position. This is true, but the objection holds against the Brewster stereoscope, not against all others. Further, this advantage is here gained at the expense of inverting the picture from right to left. He makes other inadmissible statements, which it is not necessary to consider here.

scopic at all, the two impressions of the photograph being *precisely alike*. It would, of course, be true that there would be no difference between a pair of such pictures viewed in the stereoscope and a single one of them viewed in the perspectoscope. The difference in this effect can readily be produced by any one who can procure two copies of the same pair of true stereoscopic pictures. Cut these in half and set up first either the two right or the two left halves, and then contrast this appearance with that obtained by viewing a right and left half. In this way the observer will soon train himself to recognize the difference between a genuine stereoscopic effect and one that only approximates it to a greater or a less extent. In the one case the object stands out with all the reality of life, while in the other case there is a relative flatness and only a pictorial type of perspective. It is something like the difference between viewing a model or a tableau and a picture; in the one case we have the difference in the two retinal images, together, of course, with all the accessory aids to the perception of depth, while in the latter case we have all the accessories but not the main factor. This experiment thus serves as an *experimentum crucis* and further indicates that it requires some little experience with stereoscopic effects to enable one to judge between the true appearance and those which more or less successfully imitate them.

It is quite an easy matter, however, to make a true stereoscope out of the perspectoscope; one need only make the reflecting mirrors adjustable and set them so that the one will reflect into the one eye one-half of an ordinary stereograph and the other mirror will reflect into the other eye the other half. Or the same result may be produced by a pair of fixed mirrors set at a suitable angle to so direct the reflected images for the stereograph of ordinary size. This form of construction for a simple and effective stereoscope has not, to my knowledge, been described.

The attempt to obtain a stereoscopic effect from a single picture has been frequently made, but in so far as it is successful it depends upon securing two dissimilar views of some picture which shall more or less closely imitate the differences between the two views of a stereograph. Le Conte Stevens* has clearly indicated that by the combination of a pair of perfectly similar conjugate pictures held inclined, like the two pages of a partly opened book, one may obtain a stereoscopic effect. In the same way photographs may be prepared from a single picture in which the picture is placed at an angle with the plane of the plate; and by suitable shifting of the angle one may secure two photographs of the original single photograph which will present differences similar to those in the two halves of a stereograph. This difference may be described by saying that in the right-hand view the left portion is somewhat crowded together and the right portion somewhat expanded, while the reverse is true of the left-hand picture. A pair of views, thus prepared, when placed in a stereoscope, give an approximate *stereoscopic effect*. In *Nature* (Feb. 3, 1898) Sir David Salomons describes an arrangement of lenses which will bring about such a distortion and will thus produce from a single picture the effects of depth. The device consists of a pair of wedge-shaped plano-cylindrical lenses, which, with their thicker edges set together, are fixed in position near the two prismatic lenses of an ordinary stereoscope and between them and the picture. A per-

* In the *Philosophical Magazine*, May, 1882. In the same place is described a reversible stereoscope which is much better suited to experimental purposes than the ordinary stereoscope, and merits a more general introduction in psychological laboratories than it has as yet secured.

sonal note adds the information that a thick cylindrical lens was used about 1¾ by 1¼ inches, with the concave surface a section of a circle, 6 inches in radius; that these lenses were fixed about one inch away from the stereoscopic lenses and about 3 inches from the picture.

I have prepared a pair of pseudo-stereographs from the one-half of a true stereograph, and could thus directly compare the life-likeness in the two cases. The advantage is entirely on the side of the true stereograph, not only on account of greater technical precision in the photographic plates, but because the degree and distribution of the dissimilarities of an actual view photographed by a stereoscopic camera more clearly imitate the retinal dissimilarities than do the two views of a photograph held at opposite angles with the camera. When I compare the result in the pseudo-stereographs with that of an arrangement like that described by Sir David Salomons (which, however, I have reproduced in general, not in precise detail) I regard the former as giving the better result. All these processes, however, are limited in scope and demonstrate that it is possible to produce a stereoscopic effect in a single picture only in so far as such a picture may be made to yield a pair of appropriately dissimilar views.

In this connection may be mentioned a device published in the set of Pseudoptics of Professor Münsterberg. It consists of a card suitably shaped to be held against the forehead and the ridge of the nose, so that the diagrams printed on the two sides of the card may be seen at close range, the one by the left eye, the other by the right, and then combined by projection outward upon a common imaginary plane. To allow for the fore-shortening of lines at this close range as compared with their projection, the vertical lines of the diagram are exaggerated in thickness as compared with the horizontal lines, and the nearer lines are proportionately heavier than the farther. This device presents a stereoscope in its utmost simplicity; but still it includes the combination of a pair of appropriately dissimilar views, and provides that each eye shall see only its own view. In the same connection may be mentioned another very simple device which is very useful for demonstration, but has not been generally described.* It may also be found in the set of Pseudoptics and consists of a pair of tubes about 1¼ inches in diameter and 8½ inches long, over the ends of which are placed caps which contain on transparent paper the pair of stereoscopic diagrams. The tubes are simply held one before each eye and are rotated until the two diagrams are superimposed, when a stereoscopic combination takes place by simple convergence. This device is again limited in scope, for the diagrams must be small and not too elaborate.

Some years ago, in verifying the possibility, or rather the impossibility, of producing a true stereoscopic effect with a single picture, I attempted to utilize the principle of the telestereoscope. This principle consists in the reflection of images first from a pair of mirrors which meet at the point between the eyes and there form an angle of about 80°, and then again from a pair of mirrors farther away to the right and left and parallel to the first set. The ordinary stereograph is then viewed by reflection from the mirrors. In this stereoscope the path of the rays is long and the picture appears diminished in size. I have recently constructed such an apparatus with the two outward mirrors set on a pivot, with which I can view either single pictures or a pair of stereoscopic ones. This apparatus is, therefore, both a stereoscope and a perspectoscope, if by the latter

*It is described in the 'American Text-book of Physiology' (1897), p. 802.

term we mean an apparatus which in one way or another imitates a true perspective. As it lacks lenses (although these could be supplied), it does not yield such striking results as other stereoscopes, but is useful in illustrating clearly the difference between a combination of a pair of different views, for the change can be made from one to the other very quickly and without involving any other modification. I am not aware that the utilization of a telescope for this purpose has been previously described.*

In Hermann's 'Handbuch der Physiologie' (3, p. 587) may be found a description of a device, originating with Hirschberger, by which the picture is viewed near by with the eyes in nearly a parallel position, and thus an approximate stereo effect is produced with a single picture. This was accomplished by means of a pair of prisms; but as the arrangement is practically an inverted telestereoscope (with the outermost pair of mirrors adjustable and spread to the distance of the space between the eyes), I have used such an inverted telestereoscope for this purpose and with very good success. The effect of depth is much better than in the perspectoscope, especially when a pair of lenses is used with this device, but it is not as effective as in a double-picture stereoscope. Geometric diagrams seem distinctly projected in space, and photographic representations are almost as clear as in an ordinary stereoscope. In other words, there are all degrees of the stereoscopic illusion from flatness to perfect solidity, and this device represents about the maximum degree obtainable with a single picture.

Another rather recent contribution is the combination of the stereoscope with the kinetoscope, thus producing the illusion of figures moving in three dimensions of space. Professor Münsterberg described such a device* in which the effect was obtained by viewing through a pair of series of slits of a large disc a single series of stroboscopic figures; the pair of series of slits is so arranged that one eye looks through the one, and the other eye through the other, and as the slitted disc and also the one with the figures rotate rapidly the two eyes obtain slightly different views of the stroboscopic figures; but the images follow one another so rapidly as to fuse and produce the illusion of motion and of depth. In a recent letter Professor Münsterberg informs me that the same effect may be produced by the use of a disc with one slit for both eyes and a mirror held a few inches behind the disc; for every slit there correspond two pictures drawn on the back of the disc, which when seen in the mirror furnish the appropriate pair of stereoscopic views. He also suggests that the same may be done by spinning such a disc upon a mirror with appropriate illumination. Dr. Sanford has also constructed a device for obtaining a stereo-stroboscopic effect.

The problem of projection by the lantern of stereoscopic pictures is receiving renewed consideration. The two methods most in vogue are those of the double lantern with the one view seen through green and the other through red light, and the other by application of polarized light. It is prob-

*I have amongst my stereoscopes one in which the lenses are prismatic in one-half only, the other half being portions of true double convex spheres. By the rotation of each lens to a definite position we can use the apparatus simply as a pair of lenses and thus view a single picture at the proper focus. The instrument is called a stereo-graphoscope. In the latter form it is intended to accomplish just what the perspectoscope accomplishes, but it is not so convenient. The apparatus is very convenient as a stereoscope, because it admits of some adjustment of the positions of the two halves of the stereograph.

*See *Psychological Review*, 1894, I., p. 56. Also Scripture, 'The New Psychology,' pp. 431–435, where this and similar devices by Sanford (*American Journal of Psychology*, 1894, p. 576) and Dvorak are also described.

able, however, that these processes will be further simplified before they will meet with general introduction. I am informed that several devices are being considered which will enable the effect to be produced by means of a single lantern. Various principles involved in the forms of stereoscope above discussed make it evident that such a device is by no means impracticable.

This eclectic summary of the progress of invention in the field of stereoscopic vision would seem to indicate that the interest in this topic is undiminished and that the field is still open for improvements and modifications which shall be useful in exhibiting the principles which underlie the workings of this truly psychological instrument.

Joseph Jastrow.

University of Wisconsin.

---

*CLASSIFICATION OF IGNEOUS ROCKS.**

Professor Merrill remarked at the last meeting of the Geological Society that rock species do not exist in the definite sense in which this term is used in the organic world. Probably no petrographer will deny this conclusion.

Admitting, then, that rocks are mineral mixtures which may vary indefinitely, it is clear that the naming of these mixtures may be carried to excess. Let us, for example, take the feldspathic lavas. These may be divided into three great groups, the alkali-feldspar lavas or trachytes, the oligoclase-andesine lavas or andesites, and the labradorite-anorthite lavas or basalts. These three groups may be written graphically as follows:

The demands of modern petrography, perhaps, require the recognition of intermediate groups which may be designated by compound names. Thus a rock intermediate between syenite and diorite may be called a syenite-diorite. Such would be the rocks called mozonite by Brögger. Between the three great groups of feldspathic lavas above outlined there may be instituted three intermediate groups, as represented in the above diagram. One group intermediate between trachytes and andesites may be called the trachyte-andesite group; that intermediate between the andesites and basalts the andesite-basalt group, and that intermediate between trachytes and basalts the trachyte-basalt group, or, as Washington has suggested, trachydolerite, adopting a term in use in Italy. The recognition of such intermediate groups seems to me quite desirable, but if the subdivisions are carried still further the results are, perhaps, of questionable value. To see how complicated the classification may easily become, let us take the single intermediate group of trachyte-basalts. There are in Italy, in the Yellowstone Park, near Buda-Pesth and in California rocks which occupy this intermediate position. These lavas have been studied by skilled petrographers, and their excellent descriptions, with the accompanying chemical analyses, leave no doubt as to their exact nature.

The following names have been proposed for different varieties:

Trachyte-basalt group:

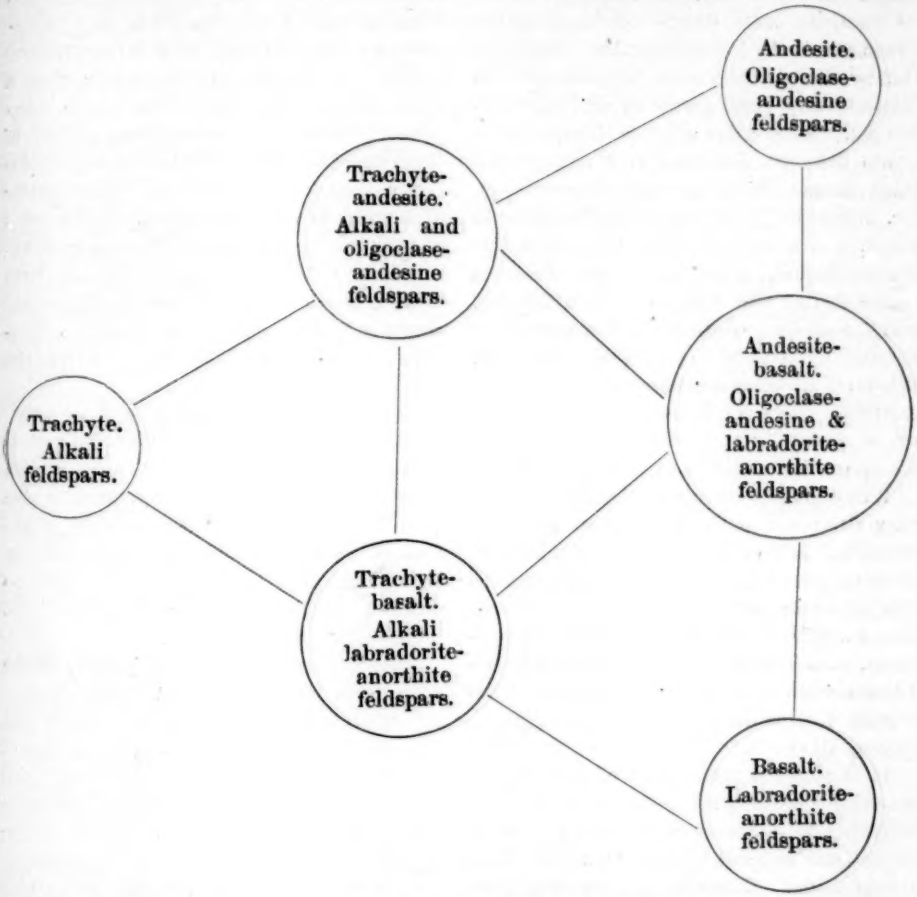
Yellowstone Park (Iddings)	Absarokite Shoshonite Banakite
Italy (Washington)	Trachydolerite Toscanite Vulsinite Ciminite
Buda-Pesth (Koch)	Labradorite-trachyte
California (Ransome)	Trachandesite (Latite).

Dr. Washington, in one of his admirable petrographic papers,* notes the close resemblance of his Italian lavas with those of the Yellowstone Park, but nevertheless

* Read before the Geological Society of Washington on February 9, 1898.

* *Journal of Geology*, Vol. V., page 363, 1897. See also table on page 366.

does not consider it advisable to apply the same names to the rocks of the two localities on account of minute differences and overlaps in chemical and mineral composition.



It is safe to assert that if a petrographer were given some specimens of similar intermediate lavas from an entirely new field to name he would find difficulty in choosing between the names adopted for the Yellowstone Park lavas and the names adopted for the Italian lavas, and the tendency would be to adopt still a third set of names, as no doubt this hypothetical third set of lavas would likewise overlap the flows in Yellowstone Park and in Italy.

Two of the names used in the above table, namely, trachydolerite and labradorite-trachyte, give at once to the reader a definite idea of the composition of the rocks. The term trachandesite* used by Dr. Ran-

*Since writing this Dr. Ransome has changed his name to a more specific name, *latite*. But as he regards his rocks as intermediate between trachyte and andesite the statements here made regarding them still apply.

some would be at variance with the set of intermediate families proposed in the above diagram. However, I understand Dr. Ransome to regard the feldspathic lavas as being more properly represented in a linear series, that is to say, the andesites would be regarded as a group intermediate between trachytes and basalts, and, following this system, it would be impracticable to institute any such group as the trachyte-basalts. The only possible intermediate group between the trachytes and plagioclase lavas would be trachyte-andesites. Dr. Ransome, in a forthcoming bulletin of the U. S. Geological Survey* on the trachandesites (latites), clearly states their relation to the Italian and Yellowstone Park lavas, and the position of these California rocks is at once evident to the reader. However, if we call all lavas composed of labradorite-anorthite feldspars, basalts, the recognition of a group intermediate between the trachytes and basalts seems inevitable.

While greater definiteness is unquestionably desirable in the naming of rocks, it seems but fair to the general geologist, and even to many who have given some time to the study of igneous rocks, that general terms should be used in all such descriptions, even if in subordinate paragraphs the rocks are given more definite names. This enables the reader at once to place approximately the rock.

It is possible that many of the current names for rocks could be improved by substituting a name derived from the most prominent mineral which enters into their composition. Thus a syenite might be called an orthosite, from the French term orthose or orthoclase. An augite-syenite would then be called an augite-orthosite. Even a granite might be called a quartz-orthosite, if in the use of compound terms we recognize only those minerals which are essential constituents and never use the names of accessory minerals in this way. There appears to be the greatest latitude in this matter. Some rocks are called hornblende-andesites in which only occasional hornblende needles are to be noted, and the same statement may be made with variation as to the mineral with a great many names. It appears to the writer that a hornblende-andesite should be a lava composed, if sufficiently crystalline, chiefly of oligoclase and andesine feldspars, with relatively abundant hornblende. This matter of keeping in mind the relative proportions of minerals in naming rocks, if carried out throughout the entire series of rocks, both with granolites and effusive rocks, would result in a name conveying at once a tolerably accurate idea of the composition of the rock.

The term basalt indicates nothing whatsoever to the reader as to what the rock is made up of. If we use the French term labradorite we have at once a definite idea as to what the mineral composition of the rock is. The term labradorite is used by the French for basalts which contain no olivine. The term olivine-labradorite could be used for olivine-basalt.

This method of deriving the name of the rock from its mineral components is thus not at all new. The andesites usually contain the feldspar andesine. The group of peridotites derives its name from the word peridot or olivine. A mica-peridotite is plainly a mica-olivine rock. An enstatite-peridotite rock is plainly an enstatite-olivine rock. There are now two terms used for the latter. One is Harzburgite* and the other Saxonite, and there has been much discussion over which name should take precedence. If we drop both terms we relieve the memory and make it plain to every one what the composition of the rock is.

*An abstract of this bulletin will soon appear in the *Am. Jour. Sci.*

*Rosenbusch, *Mikroskopische Physiographie der Massigen Gesteine*, 1896, p. 355.

It is, of course, evident that such mineralogical names cannot be applied to rocks of complex composition.

It seems clear that the naming of rocks may be carried to excess, and that the science of petrography may readily be buried under its own nomenclature.

H. W. TURNER.

U. S. GEOLOGICAL SURVEY.

THE DIVERSE FLORAS OF THE ROCKY MOUNTAIN REGION.

FEW persons living in the Eastern States are aware of the greatly diversified country which is included under the general title of the Rocky Mountain region. I have often been requested by correspondents to procure species which, being recorded from the 'Rocky Mountains,' were presumed to exist just outside my door, but which, as a matter of fact, were not obtainable within a hundred miles.

The striking diversity which exists, according to altitude, latitude and longitude, is worthy of attention from several points of view. To the horticulturist or botanist it suggests great possibilities of finding even conspicuous new species as new localities are explored. To the horticulturist it also strongly suggests possibilities in the way of fruit-raising, since those localities which have different wild plants are likely to be suitable for different and peculiar varieties of fruits. Valleys now uncultivated may in the future become famous for their special varieties of wine-grapes, of apples, peaches or vegetables. What has been done in Europe may be repeated here in time. Then again, to the geologist the facts are extremely significant. If the present flora of our region could be preserved in the rocks we should have a series of beds absolutely contemporaneous, yet exhibiting almost totally different sets of fossils, not merely as to species, but as to genera. The animal remains would be almost equally diverse; the insects even more so than the plants.

On August 30, 1889, I noted the more conspicuous plants observed in a short walk by Willow Creek, Custer County, Colorado, at about 8,200 feet altitude. The list is given here, and in a parallel column the nearest approximation to it obtainable in the immediate vicinity of my present home, Mesilla, New Mexico, 3,800 feet above sea level.

WILLOW CREEK, COLORADO.	MESILLA, NEW MEXICO.
Aconitum Columbianum.	Clematis ligusticifolia.
Delphinium scopulorum.	Ranunculus Cymbalaria.
Actæa spicata.	
Berberis repens.	(No Berberidem.)
Erysimum asperum, var.	Sisymbrium, spp.
Viola Canadensis.	(No Viola.)
Silene Scouleri.	(No representative.)
Sidalcea candida.	Sphæralcea angustifolia.
Geranium Richardsoni.	(No representative.)
Lupinus argenteus, var.	Sophora sericea.
Thermopsis montana.	Dalea scoparia (with a forma nov. subrosea, flowers magenta).
Oxytropis Lamberti.	Astragalus Wootoni.
Fragaria vesca.	Prunus sp. (escaped from cultivation).
Potentilla fruticosa.	
Rosa blanda, var.	
Parnassia fimbriata.	(No representative.)
Ribes oxyacanthoides.	
Epilobium angustifolium.	Œnothera Hookeri and Œ. pallida.
Osmorrhiza nuda.	(Nothing near.)
Heracleum lanatum.	
Lonicera involucrata.	(Nothing near.)
Galium boreale.	(Nothing near.)
Aster lævis.	Aster tanacetifolius.
Aster Fremonti.	Aster canescens.
Erigeron glabellus mollis.	Erigeron divergens.
Gymnolomia multiflora.	Verbesina encelioides.
Achillea millefolium.	Lepachys Tagetes.
Rudbeckia laciniata.	Helianthus annuus.
Cnicus Parryi.	Cnicus ochrocentrus, var.
Troximon glaucum.	Pyrrhopappus, sp.
Campanula rotundifolia.	(Nothing near.)
Arctostaphylos uva-ursi.	(No Ericaceæ.)
Pyrola rotundifolia, var.	
Apocynum androsæmifolium.	Apocynum cannabinum (fide E. O. Wooton).
Gilia aggregata, var.	Gilia, sp.
Echinospermum floribundum.	Krynitzkia, sp.
Mimulus luteus.	Maurandia Wislizeni.
Castilleia integra, var.	
Orthocarpus luteus.	
Pedicularis procera.	
Polygynum aviculare.	Polygonum, spp.
Polygonum tenue.	
Polygonum convolvulus.	
Chenopodium album.	Chenopodium leptophyllum.
Comandra pallida.	Comandra pallida.
Quercus Gambelii.	(No Quercus.)
Populus tremuloides.	Populus Fremonti.
Iris Missouriensis.	(Nothing near.)
Smilacina stellata.	Yucca, spp.

Streptopus amplexifolius.	
Veratrum Californicum.	
Phleum pratense (ex. cult.).	
Juniperus communis.	Ephedra.
Picea Engelmanni.	(No Picea.)
Picea pungens.	
Pinus ponderosa scopulorum.	(No Pinus.)
Pteris aquilina.	(No Ferns.)
Equisetum arvense.	Equisetum, sp.
Equisetum hiemale.	
Marchantia polymorpha.	
Puccinia veratri.	Puccinia evadens, P. sphæralcew
Usnea barbata.	

I have not given very much study to the flora of Mesilla, because my friend, Professor E. O. Wooton, is working upon it, so it may be that there exist a few better representatives than I have cited. I have, however, examined the flora a good deal in my searches for insects, so it is not probable that much change would be necessary. It will readily be appreciated that if the Colorado species had been found as fossils, and another bed in New Mexico, rich in plant remains, had shown no more resemblance to the first than is here shown, geologists would have been very ready to assign different ages to the beds.

Local lists of plants, as ordinarily published, do not sufficiently bring out the differences between florulæ. In the first place, collectors will often mix up two or three florulæ in one list; in the second, in the effort to make a complete list, they will include plants which are either extremely rare or actual aliens. In these days of railroad travel, it seems common to see near railway lines, and in other places, little colonies of plants out of their proper environment, which persist a while and then perish.

I now propose to show that such differences as above indicated do not only occur between the recognized zones, but within the limits of the same zone.

In Mesilla, New Mexico, on June 18, 1897, I collected weeds in the cultivated ground of the Casad orchard. I give the list; and in a parallel column a list from the sandhills, also in Mesilla, choosing as nearly representative plants as I can. For the determinations of many of the plants I am indebted to Professor E. O. Wooton.

Cultivated Ground, Mesilla.	Sandhills, Mesilla.
Anoda hastata.	Mentzelia multiflora.
Sphæralcea angustifolia.	Dithyræa Wislizenii.
Sida hederacea.	
Gaura parviflora.	Œnothera pallida
Glycyrrhiza lepidota.	
Sophora sericea.	Dalea scoparia.
Meilotus indica.	Dalea lanosa
Franseria Hookeriana.	Prosopis juliflora glandulosa.
Baccharis glutinosa.	
Astera tanacetifolius.	Aster tanacetifolius.
Helianthus ciliaris.	Aster canescens.
Helianthus annuus.	Artemisia, sp.
Aster spinosus.	
Lepachys tagetes.	Lepachys Tagetes.
Flaveria repanda.	Pectis papposa.
Xanthium Canadense.	Pluchea borealis.
Erigeron Canadensis.	Bigelovia Wrightii.
Verbesina encelioides.	Baileya multiradiata.
Aphanostephus ramosissimus.	Aplopappus spinulosus.
Curcubita fœtidissima.	Maurandia Wislizenii.
Ipomœa Mexicana.	Abronia turbinata.
Cuscuta (C. Californica ?).	Abronia cycloptera.
Salvia lanceolata.	Nama hispidum.
Physalis (P. lanceolata ?)	Phacelia integrifolia.
Solanum elæagnifolium.	Gilia, sp.
Portulaca oleracea or retusa.	Eriogonum, sp.
Acanthochiton Wrightii.	Acanthochiton Wrightii.
Polygonum near erectum.	Atriplex canescens.
Chenopodium leptophyllum.	Oryzopsis membranacea.
	Ephedra, sp.

The sandhill list could readily be extended by further study. The purpose just now is merely to show that two radically different floras occur in the same immediate vicinity, at the same altitude, on different kinds of soil. Cultivated lands here vary from the very sandy to the almost pure adobe, and it may be assumed that they are thus adapted for very different crops, and require different methods of cultivation.

It will be at once remarked, from the data given in this and the preceding paper, that two quite different factors have had to do with the modification of the flora. In the one case the principal factor is the climate, in the other the soil. Nevertheless, the two are intimately connected, for the soil greatly modifies the effect of the climate. Another very important factor is shade, which is present in the Colorado case. Moisture, again, is controlled partly by the general climate and partly by the

general nature of the soil—not merely the surface soil, but the underlying beds.

The professional botanist will find these notes, if new in themselves, merely illustrative of general laws long familiar to him; but they are written in the hope that others may find them interesting, and may perhaps be stimulated to make similar observations elsewhere. It is surely desirable for horticulturists to pay more attention to such matters when selecting land and choosing what to grow upon it.

T. D. A. COCKERELL.

MESILLA PARK, N. M.

CURRENT NOTES ON PHYSIOGRAPHY.

THE NIAGARA GORGE.

WHEN the gorge of Niagara was first ascribed to work of the river, it was tacitly postulated that the volume of the water and the rate of recession of the falls had been constant. This postulate gave way before the suggestion that variations in river volume may have occurred during the disappearance of the ice sheet. Now it is attempted to correlate these variations in volume on the one hand with the retreating ice front, the northeastward elevation of the land, and the temporary discharge of the upper great lakes across Ontario, and on the other hand with the breadth and depth of the gorge. A recent paper by Taylor on the 'Origin of the Gorge of the Whirlpool Rapids at Niagara' (*Bull. Geol. Soc. Amer.*, IX., 1898, 59–84) explains the narrow part of the gorge, where it is crossed by the railroad bridges and occupied by the Whirlpool Rapids, as the work of the discharge of Lake Erie alone—that discharge being called the Erie-Niagara River—while the upper lakes ran to the St. Lawrence by the Nipissing-Mattawa channel, eastward from the then expanded Georgian Bay. Before the ice sheet had retreated far enough to open this outlet the upper lakes discharged through Erie, and the large volume of Niagara at that time caused the erosion of the wider gorge and deeper gorge just below and above the Whirlpool.

It is thus implied that the channel of Detroit River must have been laid dry while the Erie-Niagara was cutting its narrow gorge, and of this Taylor has found good evidence in the depth to which the valleys of small tributaries of the Detroit are eroded below the present river surface. The manner in which many independent factors are thus correlated is really of dramatic interest.

SOUTH CAROLINA.

L. C. GLENN describes the physical features of South Carolina (*Journ. School Geogr.*, II., 1898, 9–15, 85–92), giving a clear picture of the piedmont plateau and the coastal plain. The piedmont is a peneplain gently rolling over most of the surface, but much dissected by narrow and branching side valleys near the main streams. About the headwaters many rapids and falls interrupt the streams; farther down the valleys the larger rivers have opened narrow 'bottoms,' whose fertility has been much impaired by wash from carelessly farmed hillsides. The middle and outer parts of the plateau carry a number of monadnocks, such as Ruff's, Parson's, King's and other low mountains. On the inner part of the plateau the residual mountains are higher and more numerous, rising 1,000 to 1,500 feet above the peneplain. The coastal plain is hilly along its inner border, low and smooth over most of its extent. Here the chief rivers have broad swampy flood plains. The numerous channels that divide the islands along the coast are ascribed to the strong tides of the Carolina bight.

It may be noted in this connection that the *Journal of Geography*, edited by Professor R. E. Dodge, of Teachers College, New York, has published a number of first-hand

articles of value to teachers, and that it is now successfully entering on a second year. The *Journal* has commended itself to the Geographical Association of England, and one of their members has been at their suggestion appointed on the board of associate editors.

DUNES IN NORTH GERMANY.

THE drift plain of North Germany is intersected by broad valleys, many of which are the work of glacial rivers. Dunes are common on the valley floors, and those near the Elbe above Boizenburg are described by P. Sabban (Die Düne der südwestlichen Heide Mecklenburgs *** Mitth. Meckl. Geol. Landesanst., VIII., Rostock, 1897). It is suggested that the dunes were chiefly formed when the glacial waters were withdrawn, leaving extensive barren gravelly plains; and that dunes, therefore, do not indicate a period of dry climate. Many of them are now more or less overgrown; some are forested, and one of these is shown in an excellent plate. Small dunes and sand deposits are found on the uplands, where the sands are blown up from the valleys. Mention is made of the manner in which dunes shed water, so that after a heavy rain they are wet to a depth of only a few inches—a point to which Shaler has called attention in this country.

In this connection, it may be stated that Keilhack reports an advance of about 9 meters yearly for several travelling dunes near the Baltic coast (Jahrb. preuss. geol. Landesamt. (1896), 1897, 194–198), giving a good view of a heavy dune invading a pine forest.

W. M. DAVIS.

CURRENT NOTES ON METEOROLOGY.

THE GULF STREAM AND THE TEMPERATURE OF EUROPE.

MEINARDUS, in the *Meteorologische Zeitschrift* for March, finds a relation between the temperatures of the Gulf Stream waters off the Norwegian coast and the temperatures of central Europe, which relation he expresses as follows: I. A high (low) temperature in central Europe in the late winter (Feb.–Mar.) and early spring (Mar.–Apr.) usually follows a high (low) temperature of the Gulf Stream off the Norwegian coast in early winter (Nov.–Jan.). II. The greater the difference in pressure between Denmark and Iceland in the period September (or Nov.) to January, the higher is the temperature of the Gulf Stream and of the Norwegian coast in the same months (Nov.–Jan.), and the higher is the air temperature in central Europe in the succeeding months (Feb.–Apr.). III. The difference in pressure above noted has only an indefinite relation to the temperatures prevailing at the same time in central Europe, and no relation to the temperatures of May and June.

ATMOSPHERIC DUST.

A SERIES of interesting observations on the 'dust' of the atmosphere is described by Melander in a recent work ('Sur la condensation de la vapeur d'eau dans l'atmosphère,' Helsingfors, 1897), as noted by Maurer in the *Meteorologische Zeitschrift* for March. The investigation was carried on by means of the Aitken dust counter, and included 3,000 observations in Finland, the Sahara, and elsewhere. Some of the results are as follows: The number of dust particles increases with the dryness of the air, there being usually a minimum in the afternoon. Winds from the land carry more dust than those from over the water, and those blowing out of an anticyclone, or down from high mountains, are very dusty. Products of combustion furnish a portion of the dust particles which cause condensation in the atmosphere. The important problem as to whether or not precipitation can occur without the assistance

of dust particles is not yet solved, but it seems certain that where these particles are present they are the effective cause of the precipitation.

METEOROLOGICAL CONDITIONS OF THE KLONDIKE REGION.

IN the 'Klondike Number' of the *National Geographic Magazine* (April) General Greely has collected, in a brief article, what little is known about the climatic conditions of the Klondike district. The observations of most interest are those made at Dawson between August, 1895, and November, 1896. From December 1, 1895, to February 1, 1896, the temperature fell below zero every day. It was below −40° on 28 days; below −50° on 14 days, and below −60° on 9 days. The January, 1896, mean was −40.7° and the February mean −35.4°. Bright weather is the rule in winter, and from October 1, 1895, to May 1, 1896, snow fell only on one day in seven. During June, July and August, 1896, the temperature rose above 70° on 29 days and above 80° on 3 days. July was the only month in which the minimum did not sink below freezing. In June it rained on 12 days. Observations at Fort Reliance, near Dawson, made in 1880–81, gave December, January and February means of −31°, −7° and −29° respectively. The thermometer registered between −40° and −66° on 35 days. Snow fell on but one day in February, and 25 days were perfectly clear.

CLIMATE AND COMMERCE.

THE control of the severe winter cold of Russia and Siberia over the commerce of those countries is well known, the blockading of their great ports by ice during the winter being one of the serious drawbacks in the development of their import and export trade. But now the ingenuity of man comes into play, and by means of huge steam rams it is found possible to keep open many of the important harbors throughout the cold season. Vladivostok now has a steam ram which is effective in keeping open its harbor. In Finland the port of Hangö is also kept open by a steam ram, and Admiral Makarof, of the Russian navy, thinks it perfectly feasible to maintain communication, through the winter, between the sea and the port of St. Petersburg. The struggles of man to overcome the difficulties which nature, through climate, puts in his way are among the most interesting of his many activities.

RECENT PUBLICATION.

FRANK H. BIGELOW: *Abstract of a Report on Solar and Terrestrial Magnetism in their Relations to Meteorology.* U. S. Department of Agriculture, Weather Bureau, Bulletin No. 21. Washington, 1898. 8vo, pp. 176, Chs. 39.

R. DeC. WARD.

HARVARD UNIVERSITY.

CURRENT NOTES ON ANTHROPOLOGY.

MEXICAN ARCHÆOLOGY.

IN the *Journal of American Folk-Lore* (Vol. X., No. 39), Mrs. Zelia Nuttall has an article on 'Ancient Mexican Superstitions' containing much information from early and scarce authorities relating to the beliefs current among the natives at the time of the conquest. Her conclusion is that most of the superstitions were simple and harmless and sprang from the same mental sources as those which prevail in civilized countries to-day.

A full description of the remarkable temple-pyramid of Tepoztlan, south of the City of Mexico, is published by Dr. Seler in *Globus* (Bd. 73, No. 8). It is illustrated with twenty-two engravings, plans and views, and contains the identification of a number of the hieroglyphic inscriptions. The gods to whom the temple was dedicated appear to have been those connected with agriculture.

THE SMITHSONIAN REPORT FOR 1895.

This report, which has just been issued, contains two lengthy articles of unusual value to the student of American anthropology.

The first is by Dr. Franz Boas, on 'The Social Organization and Secret Societies of the Kwakiutl Indians.' It covers 430 pages, is abundantly illustrated, and the material, personally collected by the author, is presented with care and accuracy. Many songs are given, with the original text, an interlinear translation and the accompanying music. It is a contribution of rare worth to our knowledge of aboriginal thought.

The second article, of 230 pages, is by Dr. Walter J. Hoffman, on 'The Graphic Art of the Eskimos.' This is a subject on which the author has been collecting for many years, and his descriptions seem to be exhaustive. The illustrations are abundant and beautiful, and the development and connections of the Eskimoan cultures are set forth with detail.

D. G. Brinton.
University of Pennsylvania.

NOTES ON INORGANIC CHEMISTRY.

The *Chemical News* for April 1st contains a paper read by Professor Andrew Gray and Professor J. J. Dobbie before the Royal Society 'On the Connection between the Electrical Properties and the Chemical Composition of Glass.' Previous experiments had shown that resistance in flint glass was greater than in potash- and soda-lime glass. Two of the glasses in the present series were specially made flint glasses with very high content of lead. Previously a glass with 40.5% lead oxid showed specific resistance of $8,400 \times 10^{10}$ ohms. Of the new glasses, one with lead oxid 42.14% gave a resistance too high to measure, but certainly over $18,000 \times 10^{10}$ ohms at 130°, while one with 46.6% lead oxid gave above $35,000 \times 10^{10}$ ohms at all temperatures to 135°. A barium crown glass, which was a borosilicate of barium and aluminum showed a specific resistance above $59,000 \times 10^{10}$ ohms up to 140°. A 'Jena' glass, which is essentially a borosilicate of zinc, sodium and magnesium, showed a resistance of 596.5×10^{10} at 43° and 0.2×10^{10} at 140°. This low resistance was to be anticipated from the high percentage of soda, but the very high resistance of the barium glass was unexpected, as this glass might have been supposed to resemble a lime glass rather than a lead glass. While it is possible this may be influenced by the boric acid present, it may also prove true that the resistance is rather affected by the high atomic weight of the barium. The 'Jena' glass showed very considerable polarization effects, and the same was true of the lead glass, while the barium glass showed little or no sign of polarization.

The same number of the *Chemical News* contains an article by P. Truchot, taken from the *Revue générale des sciences* on the occurrence of thorite, monazite and zircon. The monazite in western North Carolina is richest in thorium and occurs in sands from a coarse mica rock. The monazite crystals are plainly seen disseminated in the rock. When the rock contains gold the monazite constitutes a very valuable by-product. Monazite is found in Idaho, where it is one of the original constituents of Idaho granite. Sands from the lakes of Idaho City have yielded, after washing, monazite sand containing 70% monazite. The European supply comes almost exclusively from the sea-shore sand in southern Bahia, Brazil. The sand is loaded directly and with very little expense on board ships. It contains 4 or 5 per cent. of thoria. Deposits of monazite are also found in Canada (Villeneuve mine, Ottawa), in several different States of Brazil, and in several other countries of South America. Zircon is

widely distributed, but the most important deposit, discovered last year, is on the northeast side of 'New Zealand' (*sic*, Tasmania), midway between Enim Bay and Circular Head. The deposit covers an area of 105 acres and has a thickness of 20 centimeters. It is composed almost entirely of zircon and is extracted simply by washing. It runs 62 to 64 per cent. zirconia, with variable quantities of the other rare earths. The author, in conclusion, states that the supply of rare earths tends to increase more and more, and, great as may become the development of incandescent gas-lighting, the demand can never exceed the supply.

IN a paper before the Cambridge Philosophical Society, Messrs. Heycock and Neville continue their studies of alloys, exhibiting Röntgen-ray photographs of plates of various gold alloys. In gold-sodium alloys with less than 30 per cent. gold they consist of well-developed, very transparent crystals of sodium in a matrix which contains gold. Alloys with more than 30 per cent. gold show very opaque needles of gold in a less opaque matrix, which was the same as the matrix of the former alloy. Similar results were obtained with gold-aluminum and gold-copper alloys. The gold-aluminum alloys showed well-defined crystals of Roberts-Austen's compound $AuAl_2$.

IN the *Comptes Rendus* E. Finck describes three compounds formed by the action of carbon monoxid on palladium chlorid, $PdCl_2CO$, $PdCl_2(CO)_2$, and $(PdCl_2)_2(CO)_3$. These compounds are interesting in that they are analogous to the similar compounds of carbon monoxid with platinous chlorid. J. L. H.

SCIENTIFIC NOTES AND NEWS.

THE RECENT ECLIPSE OF THE SUN.

IN the last number of the *Independent* Professor C. A. Young condenses from the *Observatory* an account of a recent meeting of the Royal Astronomical Society devoted to the solar eclipse at which several of the observers presented preliminary reports of their work, and exhibited some very interesting photographs of the corona, and of various eclipse spectra. Professor Young writes:

According to Professor Turner's photographs (and, of course, all the others agree substantially, which is by no means the case with visual observations of that phenomenon), the corona was of the type expected and predicted for the present stage of the sun-spot period. It had the form of an irregular four-rayed star, with long streamers projecting from the sun-spot zones to a distance considerably exceeding the sun's diameter, and others, shorter and narrower, but more distinct in outline, from the polar regions. In one of the long streamers Professor Turner's polariscopic camera showed distinct polarization, indicating the presence of something besides gas—dust or mist of some kind.

The corona was hardly as bright as usual, so that Mr. Newall did not succeed in his attempt at a spectroscopic determination of its rotation; but Captain Hills, of the Astronomer Royal's party, was able to get fine photographs of its spectrum, and to reobserve the violet lines first detected in 1893, and to determine their position accurately.

He also obtained (and with a *slit*-spectroscope, a new success) excellent photographs of the 'flash spectrum.' It shows hundreds of bright lines, and so far is in entire agreement with the visual observation of the writers' made twenty-seven years ago; but Captain Hills agrees with Sir Norman Lockyer that it cannot be described as a reversal of the Fraunhofer lines, as regarded by most astronomers, because 'the lines have different relative intensities; strong Fraunhofer lines are absent in the flash, and bright lines are present in the latter which are absent, or very faint, in the solar spectrum.' Mr. Fowler, Sir Norman Lockyer's assistant, was also present with his prismatic-camera negatives, and concurred with Captain Hills on this point. Both gentlemen, however, have always been faithful followers of Lockyer in his peculiar views, and took the same ground in regard to Mr. Shackleton's photograph in 1896.

In this case the comparison of the flash-spectrum with an ordinary solar spectrum of the same dispersion seemed to the writer, and to nearly all who made the examination, to indicate that the former was simply a combination of the spectrum of the chromosphere with a reversed Fraunhofer spectrum. In the region of the spectrum covered by the photograph only one conspicuous Fraunhofer line is missing from the flash, and there is no difficulty in plausibly explaining such an absence, or in accounting for the other considerable discrepancies of relative intensity. It is to be hoped that astronomers in general may soon have the opportunity to study some of these new photographs for themselves. It is interesting to note that a little later in the evening Mr. Evershed showed photographs of the violet region of the spectrum, made only eighteen seconds after totality; and in these, 'apparently *every* dark line of the Fraunhofer spectrum ends in a short bright line,' just as it should on the accepted 'reversing layer theory.' Clearly the matter cannot yet be regarded as settled.

In a very real sense the eclipse observations are still going on—in the study, measurement, comparison and discussion of the photographs. These records, authentic and permanent, will probably in time supply such data as will warrant an authoritative decision of the question. Very likely, too, they will go far toward the solution of some of the other 'pending problems' of solar physics, and quite possibly they will present new ones still more perplexing. But the complete and final report cannot be expected for some months yet.

THE PHILADELPHIA ZOOLOGICAL GARDEN.

The annual meeting of the Board of Directors of the Philadelphia Zoological Society was held on April 28th. The report of the Secretary, according to the account in the Philadelphia *Ledger*, stated that there are now 1,981 members, of which number 1,330 are life, 360 annual and 261 perpetual. The record of admissions to the gardens shows 173,999 during the year ending February 28th, which is an increase of 369 over 1897. In addition to these, 125,000 tickets were issued for the pupils of the public schools. The receipts from gate admissions aggregated $23,908.

The report of Treasurer Henry T. Coates shows total receipts of $38,359.11, including $10,000 appropriated by the city; the expenses amounted to $38,191.35, leaving a balance of $167.76. The sum of $3,806.30 was spent for for the purchase of animals.

There are now in the gardens 1,019 living animals, including 339 mammals, 421 birds, 238 reptiles and 21 batrachians. The total number of specimens received during the year was 735. Among the more important acquisitions is a rare species of whip snake, received from Herbert Browne, of Tucson, Arizona.

On April 23d two young West Indian seals were purchased in Pensacola, Fla. The report states that, although the existence of a peculiar species of seal in the Caribbean Sea has long been known, no detailed description had been given of it until very recently, and no living specimens have been secured until a schooner was sent out last spring for the purpose of capturing some, which it finally effected off Yucatan. It was hoped that observations might be made upon the habits of this almost unknown species, but, unfortunately, in all the cases the animals were with difficulty induced to take food, and lived but a short time.

A male dromedary was purchased in Baltimore on the 2d of November, and a few weeks later a female Bactrian camel was received. The original stock of camels of both species, which had been for many years in the gardens, has now entirely disappeared, due largely to continued inbreeding.

The principal loss by death was the male orang 'Chief,' November 3, 1897. This animal was received at the gardens November 16, 1893, and was, perhaps, as fine a specimen of his kind as any which have been exhibited. The autopsy showed the animal to have been in such complete health that the accidental nature of his death was greatly to be regretted. It is worthy of note that, while it has more than once been pronounced by high authority to be anatomically impossible for the orang to maintain an erect attitude without touching some means of support, this animal was repeatedly observed walking about his cage in an abso-

lutely erect position without having his hands in contact with any fixed object.

The outside cages at the new monkey house were erected and put into use during the summer, thus finally completing what is without doubt the most pleasing and well adapted building on the grounds. Plans have been prepared for a house for small mammals, to be erected upon the site of the old monkey house, all of which will be torn down, with the exception of the stone portion of the outer walls.

A large piece of ground lying between the Carnivora House and the eastern main walk has been enclosed by an iron fence, to contain the elk and a similar pen, has been made for common camels on the opposite side of the walk to the west.

A similar construction is projected on the western main walk, opposite the Carnivora House, for Bactrian camels. The removal of the elk and camels from the series of pens on the western side of the gardens has made it possible to give the American buffalo the whole space, measuring some 420 feet in length, with a depth of from 110 to 180 feet. While the conditions afforded by such an enclosure fall far short of those which are to be desired, they are probably as good as can be supplied in a zoological garden of average size, and, on the whole, the condition of the herd of buffalo owned by the Society is most gratifying.

SOLOMON STRICKER.

WE take from an obituary notice in *The British Medical Journal* the following details regarding the life and work of the late Professor Stricker.

Born in 1834 in Waag-Neustadt, in Hungary, he studied in Pressburg and Ofen Pest; afterwards he went to Vienna, where he 'inscribed' as a student of law, but soon turned to medicine. In his second year of medical study he began to work under Brücke (1855–58). In 1858 he graduated as M.D.; in 1859 he became Assistant in the General Hospital, in 1862 a *Privat-docent* for 'Entwicklungsgeschichte,' and in 1863 he again became Assistant to Brücke. In 1865 he published his discovery of the diapedesis of the red blood corpuscles and the contractility of the capillary wall. At the end of the war of 1866 Cohnheim was in Vienna, where began a friendship between these two. In 1866 Oppolzer selected Stricker to develop the experimental method as applied to physiology and pathology in his clinic. Through the strong friendship which sprang up between Stricker and Rokitansky, Stricker in 1868 was nominated professor (extraordinarius) of experimental pathology, with a very modest and limited laboratory. In 1869 appeared his *Studien a. d. Institute f. exp. Pathologie.* In 1870 he visited England, and in 1871 his then assistant, Dr. Klein, came to London.

In 1871–73 appeared his *Handbuch d. Lehre v. d. Geweben d. Menschen u. d. Thiere* (translated in 3 vols., New Sydenham Society, *Human and Comparative Anatomy*). Chiefly through the influence of Rokitansky, Stricker was nominated professor of general and experimental pathology. The chief results of the work done by his pupils in his laboratory were edited by Stricker, and published in the well-known *Med. Jahrbücher* (1871–80). In 1877–83 appeared his *Vorlesungen über allgem. u. exp. Pathologie.*

Stricker recognized the importance of experimentation for the advancement of medicine, and, although in his course in 1883 he confined himself to histological demonstrations, he soon developed an auditorium replete with apparatus for all kinds of experimentation, and so arranged that everyone in the audience could profit thereby. He laid great stress on this subject in his lectures, which were often attended by over 400 students.

Stricker regarded the study of tissues not as an end, but as the means of ascertaining the course of events in living tissues; he studied not so much tissue morphology as tissue physiology, and to this end he invented his 'hot stage.' Stricker, through his pupils, also contributed much to our knowledge of vasomotor nerves, efferent fibres in the posterior roots of spinal nerves, the action of diuretics, the anæsthetic action of cocaine, etc.

Besides strictly medical papers, Stricker published several philosophical works: 'Studien über Bewusstsein' (1879), 'Sprachvorstellung' (1880), 'Bewegungsvorstellung' (1882), 'Association d. Vorstellungen' (1883), and 'Physiologie d. Rechts' (1884).

In all he published 134 papers from his own pen, and under his direction over 400 were published by the pupils—numbering 123—who worked in his laboratory under his direction. Of these pupils 45 are already professors and 17 *Privatdocenten*.

Stricker lived very much apart and went very little into society. What interested him he fought for, regardless of consequences. Perhaps his position in Vienna in later years may be summed up in the words of one of his assistants—Georg Kapsammer—from whose short biographical notice of Stricker most of the above facts are taken: "Stricker's life was one rich in work, rich in results, rich in disputes; rich in luck and honors it was not."

GENERAL.

Professor William James, of Harvard University, has been appointed Gifford lecturer to the University of Edinburgh for the years 1899–1901. He will give two courses of ten lectures each on 'Natural Religion.' Professor James has also been elected correspondent of the Institute of France (Acad. des Sciences morales et politiques).

Professor J. M. Schaeberle has resigned his position as astronomer at the Lick Observatory. The Regents of the University of California have accepted the resignation, to take effect after one year, with leave of absence and salary for the year.

M. Deslandres, whose astrophysical work is well known, has been transferred from the observatory at Paris to the astrophysical observatory at Meudon.

The freedom of the city of Edinburgh will be conferred on Lord Lister on June 15th.

The University of Aberdeen has conferred its LL.D. on Dr. Charles Chree, Superintendent of Kew Observatory. The University of Edinburgh has conferred the same degree on Mr. Horace T. Brown, F.R.S.; Professor D. G. Ritchie and Professor J. V. Carus, of Leipzig.

Dr. H. M. Fernando will, says *Nature*, probably be the Director of the Bacteriological Institute to be opened in Colombo shortly. The final plans for the building have been completed, and the work will be taken in hand at once. It is expected that the Institute will be opened by the beginning of next year.

The Council of the University of Paris has appointed MM. Milne-Edwards and Blanchard delegates from the University to the approaching meeting of the International Zoological Congress.

M. Kunckel d'Herculais, the French naturalist, has, at the request of the Argentine Republic, been entrusted with the establishment and conduct of a bureau of economic entomology at Buenos Ayres.

The Council of the Linnæan Society has, as we have already announced, decided to award the Society's gold medal for the year to Mr. G. C. Wollich, in recognition of his valuable scientific labors connected with the investigations of the biological conditions of the deep sea. Regarding this event the London *Times* relates that it is now nearly forty years since Mr. Wollich accompanied Sir F. L. McClintock in her Majesty's ship *Bulldog* on an expedition despatched by the British government for the preparatory survey of the route for the telegraph cable between England and America. Notwithstanding that dredging was foreign to the object of the expedition, Mr. Wollich obtained materials, slender and fragmentary as they were, which led to his discovery of the existence of a deep-sea fauna. Though some of his opinions and conclusions have not survived the test of subsequent research, many of them have been established on conclusive proof. Dr. John Murray, of the *Challenger*; Dr. Günther, President of the Linnæan Society, and Mr. George Murray, of the Botanical Department of the British Museum, have all borne testimony recently to the value of Mr. Wollich's work.

A committee, with the Mayor of Boulogne as Chairman, has been formed for the purpose of erecting a monument to the memory of 'Duchenne de Boulogne.'

A bust of the late Professor P. Schützenberger was unveiled at the Paris École de physique et de chimie industrielles, of which he was the first Director, on April 3d.

We regret to record the death of Dr. Georg Dragendorff, professor of pharmacy at Rostock, at the age of 62 years, and of Dr. F. Sand-

berger, professor of mineralogy at Würzburg, aged 72 years.

MR. MELVILLE ATWOOD, geologist and metallurgist, died on April 25th, at Berkeley, Cal. He was born in Worcester, Eng., on July 31, 1812, and went to the gold and diamond mines of Brazil at an early age. In 1843 he made a discovery that increased the commercial value of zinc ore. He came to California in 1852, and invented and introduced the blanket system of amalgamation. He was a member of the Academy of Science and of the Microscopical Society of San Francisco, and a Fellow of the Geological Society of London.

REFERRING to the recent death of Professor Aimé Girard at the meeting of the Paris Academy on April 12th, M. Th. Schloesing, according to the translation in *Nature*, remarked: "M. Aimé Girard was the highest authority on chemical and agricultural industries in the Academy. After some valuable scientific work he was nominated professor of industrial chemistry at the Conservatorie des Arts et Métiers, in succession to Payen. His teaching revealed the dominating object of his efforts. Affable and cheerful, loyal and entirely disinterested, he possessed all the attributes required to gain the confidence of manufacturers. The producers whose places he visited, in France and in other countries, became and remained his friends; they gave to him a large amount of information which he used to enrich his attractive lectures, and in return M. Girard offered them advice suggested by his experience and his own investigations. In a few years his masterly researches on vegetable fibres, wheat, farinas, sugars and woods had made him the first authority upon these matters, and he was frequently consulted by the government on subjects concerning the great industries of paper, alcohol, sugar, flour and bakery. The study of these products led to inquiries as to crops. In this new direction M. Girard rendered valuable services, and, after his researches on the cultivation of sugar-beet and the improvement of the potato, he obtained among agriculturists the same position and the same sympathies which he enjoyed in the industrial world. Though weakened in recent years by illness, and saddened by repeated troubles, he nevertheless continued his work. He died while occupied in applying to wheat of various origins the new methods of analysis which were the subject of a recent communication to the Academy. The vacancy which his death has caused enables us to estimate the high place which he occupied in scientific societies and in the committees in which he took part."

THE Sanitary Institute of Great Britain will hold its next meeting in Birmingham, commencing on September 27th. Sir Joseph Fayrer, Bart, is the President.

THE twenty-seventh Congress of German Surgeons was opened on April 13th in the hall of the Langenbeckhaus in Berlin by the President, Professor Trendelenburg, of Leipzig. About 300 members were present. A donation was announced of 50,000 Marks from the Langenbeck family, the interest of which sum is to be devoted to studies in military surgery. Professor Hahn, of Berlin, was elected President for the next Congress.

THE Société Français de Physique held its annual exhibition of apparatus in its rooms on April 15th and 16th. Addresses were made by MM. Ducretet, Morin and Hurmuzescu.

THE regular public lecture for April of the N. Y. Academy of Sciences was given on the 27th inst., by Dr. James Douglas, his subject being the progress of mining and metallurgy during the last half century.

AT the Paris Museum of Natural History, M. Stanislas Meunier has begun a course of lectures on experimental geology in which he will discuss the attempts that have been made to reproduce artificially geological phenomena.

MR. HARVEY will give, at the approaching annual meeting of the Paris Academie des Inscriptions, an address on the introduction, in 1647, of the teaching of chemistry in France through the Scotchman Davisson.

WE referred recently to the efforts of the Prince of Monaco for the establishment of an observatory in the Azores for meteorological, seismic and other observations. He addressed the Royal Society on the subject last week and proposed that the observatory be made international in character.

UNIVERSITY AND EDUCATIONAL NEWS.

DOCTORATE FELLOWSHIPS AT THE UNIVERSITY OF CHICAGO.

THE Senate of the University of Chicago, acting upon the recommendation of the Graduate Faculties, has proposed, for the consideration of the Trustees, the following plan for more advanced fellowships:

For the purpose of encouraging research as distinguished from the purpose of encouraging less advanced students to secure training to qualify them for research, the University offers Doctorate Fellowships upon the following conditions:

1. Candidates shall have received the degree of Doctor of Philosophy from the University of Chicago.

2. Candidates must specify in detail the line of investigation which they wish to pursue, and they must obtain the unanimous endorsement of the officers of the department or departments within which the proposed work falls.

3. Incumbents are expected to devote at least nine months of each year exclusively to their research work at the University. They may, however, by special permission, carry on excavation, exploration or consultation of original material wherever the problems under investigation may demand.

4. Doctorate Fellows are expected to prepare the results of their researches for publication. This work is accepted in lieu of all teaching or other service to the University during occupancy of the Doctorate Fellowship.

5. In cases of exceptional ability, students of independent means who have received the degree of Doctor of Philosophy may be made Honorary Doctorate Fellows without income from the University. With this exception, their relationship to the University will be the same as that of regular Doctorate Fellows.

6. The income of each Doctorate Fellowship is seven hundred and fifty dollars ($750.00) per year. Appointments are made annually, but incumbents are eligible to reappointment for a total term not exceeding five years.

7. It is assumed that Doctorate Fellows need no formal instruction, but that they may pursue their researches independently. They are, therefore, exempt from payment of the regular tuition fees. They are required, however, to pay the special laboratory fees and to pay for the material used in their researches.

GENERAL.

A FELLOWSHIP in architecture of the value of $2,000 has just been established in Cornell University.

AMONG the recent appointments at the University of New Mexico at Albuquerque are the following in science: Professor E. P. Childs, formerly of Denison University, assumes charge of physics and chemistry; Professor John Weinzirl, late of the Wisconsin Experiment Station, is director of the bacteriological laboratory and assistant professor of biology; Mr. F. S. Maltby, late of Johns Hopkins, is assistant in the bacteriological laboratory, and Mr. E. G. Coghill, of Brown, is laboratory assistant in biology. A rather unique plan for a summer school in geology and mining has been adopted. A field class will spend two months in the study of the exceedingly interesting area containing the Magdalena mountains, doing careful topographical and geological work and completing a geological map of the region. A practical study of faults in their influence on the various mining problems will be made, and also practical observation of the routine work of a smelter and concentration plant in all the details. The party is under the immediate direction of President Herrick, of the University, who has minutely studied the region. A few students of geology and mining engineering can be accommodated if properly introduced. The only fee is ten dollars for entrance and only half a dozen can be accommodated from outside the Territory. Collections in botany, zoology and paleontology will be made.

THE New York University has given out the program of its fourth summer session for teachers and college graduates. Thirty courses are offered in eight different departments. The session will be held at University Heights, New York City, July 5th–August 19th.

AT the Cornell University Summer School

(Ithaca, N. Y.), Professor Geo. F. Atkinson offers five courses in botany during the summer of 1898 (Six weeks, from July 5th–August 13th). Three of these courses are especially designed to meet the wants of teachers in the high schools, and one course is to satisfy a growing desire for information concerning mycology.

THE Faculty of the University of Nebraska, after long consideration, have recommended the establishment of three 'general' groups or courses, viz., classical, literary and scientific, for the large class of students who desire general culture rather than specialization along any particular line. In these general groups fully three-fourths of the subjects are prescribed. In every case the aim has been to give the student an introduction to several of the principal lines of modern intellectual activity, without taking him into those phases of each subject which belong to the specialist. For the specialists in language, literature, history, economics and science the groups or courses hitherto existing will be still more extended to meet a growing demand.

THE University of Nebraska is erecting the north wing of its new Engineering Hall, to supply additional rooms for the work in electrical and mechanical engineering. Externally the walls are to be faced with chipped bricks, while all the interior surface is to be of smooth brick finish. This wing will provide about 21,000 square feet of floor space, which is a little less than one-half of the whole building.

AT a recent meeting of the Regents of the University of Nebraska the office of 'Dean of Women' was created, and Mrs. H. H. Wilson, of the class of 1880, was elected to the new office. She will assume her new duties at the opening of the next collegiate year. At the same meeting the Regents took action looking to the development of a department of domestic economy, and Miss Rosa Bouton, M.A., of the class of 1891, was elected to take charge of the work. Miss Bouton has been for six years an instructor in chemistry in the University and has already made considerable progress in the development of work in domestic chemistry.

PROFESSOR JAMES SHELDON, of the University of Wisconsin, has been elected professor of electrical engineering in Lafayette College.

DR. JAMES H. LEUBA, who was elected a year ago associate in psychology and pedagogy at Bryn Mawr College, will begin his courses next year. The fifth floor of Dalton Hall is being adapted to the requirements of a psychological laboratory, and the necessary apparatus is being procured.

WILLIAM B. HAMPSON, B.M.E., instructor in graphics and machine design in the University of Nebraska from 1893 to 1897, has been appointed mechanical engineer for the Oregon lines of the Southern Pacific Railway, with headquarters at Portland, Oregon. Frederic E. Clements, instructor in botany in the same University, has declined an election to the chair of plant pathology in the Maryland Agricultural College.

DR. F. NOLL, of Bonn, has been appointed professor of botany and director of botanical instruction at the Agricultural Academy at Poppelsdorf, in the place of Professor Friedrich Körnicke, who has resigned.

DISCUSSION AND CORRESPONDENCE.

ISOLATION AND SELECTION.

TO THE EDITOR OF SCIENCE: Mr. Hutton's letter in the last number of SCIENCE on 'Isolation and Selection' gives occasion to speak of a common misconception regarding the nature of evolution. So long as we proceed on the fundamental assumption that an organism, left to itself, will continue indefinitely to reproduce its like, neither Isolation nor Selection can be of any service in evolving characters *unlike* those of its ancestors. If heredity, the principle of breeding true, be assumed to be the fundamental principle controlling the generation and development of organic bodies, then the most favorable conditions of existence will be those least interfering with the operation of this principle, and the fittest race, or line of generating individuals, will be that one which reproduces its kind with greatest precision.

The very fact that isolation, or change of environmental conditions, results in increased de-

parture from the ancestral type is evidence that the hereditary principle is not the dominant one in organic activity, not the motive power, so to speak, which keeps up the continuity of living. Heredity is rather to be considered as the resultant of the total constraints and interferences of environment, an equilibrium established between the medium in which the organism lives and its own intrinsic energy. Hence, we may speak of heredity as acquired, while variation, change or evolution is that fundamental principle in all vital activity which constitutes the chief distinctive characteristic of living organic bodies.

It is expressed in the chemical phenomena of metabolism, in which there is a diversion from the normal relations of stability of equilibrium among atoms, up to a state of instability and complexity of composition; physically it is expressed in the phenomena of the cellular bodies passing from rest, simplicity and relative homogeneity, up to states of activity, multiplicity and heterogeneity and the development of the individual; and evolution of a race, or the acquirement of characters not possessed by ancestors, is a still higher exhibition of the same principle.

Undoubtedly Darwin, writing the 'Origin of Species,' thought he had discovered, in Natural Selection, the chief cause of this evolution, and evolutionists have since been following his lead. But a calm review of the facts in the case must convince us that we are no nearer finding the cause of evolution than we were before Darwin. In explaining, so far as we have, the Origin of Species, we have been discovering the relations which natural selection, isolation and other so-called 'factors of evolution' bear to the production of those temporary vortices in the path of evolution which we call 'individuals' and 'species.' The method of action of these 'factors' is by inducing the repetition of favorable steps of variation, swinging them back into cycles of reproduction, and thus making species where favorable conditions exist; in other words, the method is by establishing the habits or laws of heredity within organisms.

It is the recognition of the evolution principle as fundamental that puts us on the right path of discovery. What we have to account for is not the evolution, but the haltings of evolution in the various stages of cell, individual and species.

Given material particles, in motion, in a resisting medium, and vortices are explainable; but no amount of change in the medium is capable of accounting for the initiation of motion in particles normally at rest.

H. S. Williams.

New Haven, Ct., April 26, 1898.

To the Editor of Science: Kindly allow me space for a word of comment on the letter of Professor W. H. Hutton in your issue of April 22d.

Professor Hutton protests against the use of the term Selection in certain cases, saying: "Selection means the act of picking out certain objects from a number of others, and it implies that these objects are chosen for some reason or other." As he refers to my views later on I think it possible that he has seen the table which I published in this Journal, November 19, 1897, reprinting it from a book of mine, in which I note twelve sorts of 'selection' in the current literature of evolution. Seeing that the definition given by Mr. Hutton is pre-Darwinian, and that much of the warfare which Darwin and subsequent evolutionists had to wage was precisely over this term Selection, leaving aside the question whether Darwin chose the term wisely or not in the first instance, it is scarcely possible now to go back to the pre-Darwinian view which Professor Hutton advocates. Indeed, he himself, in this letter says concerning natural selection: "The term has become so firmly established that it can well be allowed to pass if used only in Darwin's sense of advantage gained in the struggle for existence, either by the individual or by the species."

This admitted, there is only one thing to do, that is to recognize the two general uses of the term Selection, the pre-Darwinian (or conscious) Selection, 'for some reason or other,' and the Darwinian (or post-Darwinian) Selection of which *survival on ground of utility* is the sole criterion. Now it is true enough that all sorts of confusion arise from the interchange of these two sorts of selection; and it was with a view

to the correlation of the different conceptions under certain headings ('means' and 'result') that I drew up the table. At the same time, I recommended that Selection in the Darwinian sense should be used only when the essential conditions of organic progress by survival are present, namely, variations* and physical heredity. These requirements the different usages of the table do fulfill; so that as each has its qualifying word ('natural,' 'sexual,' 'organic,' etc.), the use of the term Selection is not ambiguous. Further, in Selection of the pre-Darwinian sort, as defined by Professor Hutton, *whenever it is a question of organic evolution*, these two conditions are also requisite, *i. e.*, variation and heredity, as in Darwin's artificial selection. So while I fully agree with Professor Hutton on the need of sharp definition of Selection, I do not see the need of taking our nomenclature back to pre-Darwinian zoology. Moreover, the attempt would be quite futile.

Professor Hutton goes on to say that Darwin's term 'Natural Selection' is better than 'Organic Selection.' He seems to suppose that the two are used for the same thing. As the proposer of 'Organic Selection' (and all the other users of the term, so far as I know, *e. g.*, Osborn, Ll. Morgan, Poulton, etc., have given it the same meaning) I have only to say that nothing of that sort is intended. Organic Selection is supplementary; it is based upon and presupposes Natural Selection. † It recognizes the positive accommodations on the part of individual animals by which they keep themselves alive and so have an advantage over others *under the operation of natural selection*. I agree with Professor Poulton in holding ‡ that, so far from coming to replace natural selection or impair our confidence in it, it does quite the reverse. And I also think that it explains phenomena of 'determinate evolution' which are not fully explained by natural selection alone. So some such new term is justified; and it is really a form of 'selection' in the Darwinian sense, for it requires both variations and physical heredity. Moreover, it is contrasted with natural selection on a point of which Professor Hutton speaks. He says: "Natural Selection is not truly selection, for the individuals can hardly be said to select themselves by their superior strength, cunning, or what not." Now, 'organic selection' supposes them doing this, in an important sense. It is a sort of artificial selection *put in the hands of the animal himself*—that is, *so far as the results go*.

As to 'isolation' (Professor Hutton's other topic), it is certainly important, but is Professor Hutton right in considering it a positive cause? He says: "It is isolation which produces the new race; selection merely determines the direction the new race is to take," and "isolation is capable of originating new species." But how? Suppose we isolate some senile animals, or some physiological minors, will a new race arise? The real cause in it all is reproduction, heredity with its likenesses and its variations. Both isolation and natural selection are negative conditions: what are called in physical science 'control' conditions, of the operation of heredity. So in seeking out such principles as 'selection,' 'isolation,' etc., we are asking how heredity has been controlled, directed, diverted, in this direction or that. Isolation is as purely negative as is natural selection. Any influence which throws this and that mate together in so far isolates them from others, as I have said in a notice of Romanes' and Gulick's doctrine of isolation, * and inasmuch as certain of these control conditions have already been discovered and otherwise named by their discoverer as 'natural selection,' 'artificial selection,' 'sexual selection,' etc., it is both unnecessary and unwise to attempt now to call them all 'isolation.' For if everything is isolation then we have to call each case by its special name, just the same, to distinguish it from others.

There remains the question as to whether isolation, in the broad sense of the restriction of pairing to members of a group, can result in specific differences without any help from 'selection' of any kind. If that should be

*I there said natural selection and physical heredity, but the first requisite is really the supply of variations.

†See my papers in the *American Naturalist*, June, July, 1896.

‡SCIENCE, October 15, 1897, and *Nature*, April 14, 1898, p. 556.

* *Psychological Review*, March, 1898, p. 216.

proved,* then there would be, it would seem, justification for the term 'isolation' in evolution theory, with a meaning not already preempted. This Professor Hutton claims, with Romanes and Gulick.

J. Mark Baldwin.

Princeton, April 26, 1898.

A VIEW OF THE OHIO VALLEY IN 1755.

Apropos of the interesting historical essay by Mr. Baker (Science, April 22, 1898), allow me to refer to an early and highly appreciative account of the Ohio valley by Lewis Evans, a clear headed contemporary and townsman of Franklin's, and the author of a 'Map of the Middle British Colonies in America,' with a descriptive text published in 1755.

Among other praises, he wrote: "Ohio is naturally furnished with salt, coal, limestone, grindstone, millstone, clay for glass-houses and pottery, which are vast advantages to an inland country, and well deserving the notice I take of them in the map. * * Were there nothing at stake between the crowns of Britain and France but the lands on that part of Ohio included in this map, we may reckon it as great a prize as has ever yet been contended for between two nations; but if we further observe that this is scarce a quarter of the valuable land that is contained in one continued extent, and the influence that a State vested with all the wealth and power that will naturally arise from the culture of so great an extent of good land in a happy climate, it will make so great an addition to that nation which wins it, where there is no third state to hold the balance of power, that the loser must inevitably sink under his rival."

While thus urging His British Majesty to dispute with the French the acquisition of the great Ohio country, Evans argues curiously against any dangerous influence that such an increase of possessions might have on the loyalty of the colonies. "Supposing the Colonies were grown rich and powerful, what inducement have they to throw off their independency? * * * Each colony having a particular form of government of its own, and the jealousy of either having the superiority over the rest, are unsurmountable obstacles to their ever uniting to the prejudice of England upon any ambitious views of their own. But that repeated and continued ill usage, infringements of their dear-bought privileges, sacrificing them to the ambition and intrigues of domestic and foreign enemies, may not provoke them to do their utmost for their own preservation, I would not pretend to say, as weak as they are. But while they are treated as members of one body and allowed their natural rights, it would be the height of madness for them to propose an independency, were they ever so strong."

Evans must have had a sharp eye for topography, as his geographical descriptions are still good enough to quote, and are indeed much better than many accounts of later date. He recognizes the fall line—'this rief of rocks, over which all the rivers fall.' The great Appalachian valley is held to be "the most considerable quantity of valuable land that the English are possest of; and runs through New Jersey, Pensilvania, Mariland and Virginia. It has yet obtained no general name, but may properly enough be called Piemont, from its situation." Of the Alleghenies, he says: "The Endless mountains * * * come next in order. They are not confusedly scattered and in lofty peaks overtopping one another, but stretch in long uniform ridges scarce half a mile perpendicular in any place above the intermediate vallies. * * * The mountains are almost all so many ridges with even tops and nearly of a height. To look from these hills into the lands is but, as it were, into an ocean of woods, swelled and deprest here and there by little inequalities, not to be distinguished one part from another any more than the waves of the real ocean."

Can any of the readers of Science give me a clue by which to reach some of the descendants of this early American geographer.

W. M. Davis.

Harvard University.

MRS. PIPER, 'THE MEDIUM.'

To the Editor of Science: Your reference to my name in the editorial note in Science for April 15th, entitled 'Mrs. Piper, the Me-

* At present it is far from being proved. Cf. Professor Cockerell's review of Romanes in this Journal, April 29, 1898.

dium,' justifies me in making some remarks of my own in comment on your remarks upon Mr. Hodgson's report of her case. Any hearing for such phenomena is so hard to get from scientific readers that one who believes them worthy of careful study is in duty bound to resent such contemptuous public notice of them in high quarters as would still further encourage the fashion of their neglect.

I say any hearing; I don't say any fair hearing. Still less do I speak of fair treatment in the broad meaning of the term. The scientific mind is by the pressure of professional opinion painfully drilled to fairness and logic in discussing orthodox phenomena. But in such mere matters of superstition as a medium's trances it feels so confident of impunity and indulgence whatever it may say, provided it be only contemptuous enough, that it fairly revels in the untrained barbarians' arsenal of logical weapons, including all the various sophisms enumerated in the books.

Your own comments seem to me an excellent illustration of this fact. If one wishes to refute a man who asserts that some A's are B's, the ordinary rule of logic is that one must not show that some *other* A's are *not* B's—one must show him either that those first A's themselves are not B's, or else that no A possibly can be a B. Now Mr. Hodgson comes forward asserting that many of Mrs. Piper's trances show supernatural knowledge. You thereupon pick out from his report five instances in which they showed nothing of the kind. You thereupon wittily remark, 'We have piped into you and ye have not danced,' and you sign your name with an air of finality, as if nothing more in the way of refutation were needful and as if what earlier in the article you call 'the trivial character of the evidence * * * * taken under the wing of the Society' were now sufficiently displayed.

If, my dear sir, you were teaching Logic to a class of students, should you, or should you not, consider this a good instance by which to illustrate the style of reasoning termed 'irrelevant conclusion,' or *ignoratio elenchi*, in the chapter on fallacies? I myself think it an extraordinarily perfect instance.

And what name should you assign to the fallacy by which you quote one of those five sitters as saying that he himself got nothing from the medium 'but a few preposterous compliments,' whilst you leave unquoted the larger part of his report, relating the inexplicable knowledge which the medium showed of the family affairs of his wife, who accompanied him to the sitting? I am not sure that the logic books contain any technical name for the fallacy here, but in legal language it is sometimes called *suppressio veri*, sometimes something still less polite. At any rate, you will admit on reflection that to use the conclusion of that sitter's report alone, as you did, was to influence your readers' minds in an unfair way.

I am sure that you have committed these fallacies with the best of scientific consciences. They are fallacies into which, of course, you would have been in no possible danger of falling in any other sort of matter than this. In our dealings with the insane the usual moral rules don't apply. Mediums are scientific outlaws, and their defendants are quasi-insane. Any stick is good enough to beat dogs of that stripe with. So in perfect innocence you permitted yourself the liberties I point out.

Please observe that I am saying nothing of the merits of the *case*, but only of the merits of your forms of controversy which, alas, are typical. The case surely deserves opposition more powerful from the logical point of view than your remarks; and I beg such readers of SCIENCE as care to form a reasonable opinion to seek the materials for it in the Proceedings of the Society for Psychical Research, Part XXXIII. (where they will find a candid report based on 500 sittings since the last report was made), rather than in the five little negative instances which you so triumphantly cull out and quote.

Truly yours,

WILLIAM JAMES.

MY note in SCIENCE was not 'editorial,' but was placed in that department of the JOURNAL for which editors take the least responsibility. I gave my individual opinion, Professor James gives his, and I fear that our disagreement is hopeless. I could not quote the 600 pages compiled by Dr. Hodgson, but I gave the concluding sentences written by *all* the men of

science whose séances were reported. Professor James blames me for not quoting the knowledge that the medium showed of the family affairs of Professor Shaler's wife, but Professor Shaler himself says, "I am * * * absolutely uninterested in it for the reason that I don't see how I can exclude the hypothesis of fraud." I wrote the note with reluctance and only because I believe that the Society for Psychical Research is doing much to injure psychology. The authority of Professor James is such that he involves other students of psychology in his opinions unless they protest. We all acknowledge his leadership, but we cannot follow him into the quagmires.

J. McKeen Cattell.

SCIENTIFIC LITERATURE.

Report of Naval Court of Inquiry upon the destruction of the United States battleship 'Maine,' in Havana harbor, February 15, 1898, together with the testimony taken before the Court. Washington, Government Printing Office, 1898. 8vo., pp. 293; illustrated by exhibits, drawings and photographs.

A message to Congress from the President of the United States, dated March 28th, accompanied the transmission of the report of the Court of Inquiry appointed to ascertain, if possible, the cause and the method of destruction of the U. S. S. 'Maine,' by an explosion, in the harbor of Havana, February 15, 1898. The message is short and merely restates in brief summary the essential conclusions of the Court; that the ship was destroyed by an explosion of a submarine mine, on the port side of the hull, well forward, and that no clew had been obtained to the train of circumstances leading to this great disaster, resulting in the death of two officers and two hundred and sixty-four of the crew, nor any evidence indicating who were the criminals guilty of this act of assassination.

The report, now before us, is a very long and intensely interesting paper, mainly given up to the simple stenographers' reproduction of the testimony of witnesses.

The testimony of the commanding officer of the shipand his staff is positive in declaring the ship to have been in good order in all respects, her crew in not only an excellent state of discipline, but also in the best of spirits and with absolutely no sign of discontent or of insubordination. Captain Sigsbee stated that 'A quieter, better-natured and apparently better satisfied crew I have never known on board any vessel in which I have served.' The executive officer testified to the maintenance of order and the compliance of all officers and the crew with the regulations which are considered essential to the morale and safety of a man-of-war, and gave positive evidence of the facts that there was no dangerous heating of coal-bunkers or other known source of danger within the vessel. Other witnesses testified to the character of the explosion, and still others, from other vessels in the harbor and from the shore, testified as to the appearance of the explosion from their various points of view. Divers gave testimony, in great detail, regarding the condition of the hull as found after the explosion, and the officers entrusted with that duty showed by means of carefully drawn sketches and diagrams the position of the ship and of its now separated main and bow sections, and gave expert testimony regarding their condition, as furnishing proof of the nature, origin and effects of the explosion, and especially as settling the question as to whether the explosion was exterior to the ship or within. This portion of the evidence is extensive and minute, and the Court was evidently determined to secure every scintilla of evidence obtainable bearing upon this vital question. The photographs and drawings appended to the report are reproductions of those presented in evidence.

According to the verdict of the court, the sworn testimony suffices to establish the following main points, to which its members subscribe under oath: The ship was on a friendly visit to Havana, as is customary among nations at peace; she was assigned a berth in the harbor by the regular harbor master; ship and crew were illustrating, at the time, a most creditable condition of excellence; there were no known interior sources of danger, and every usual precaution, and some unusual care, was taken in the internal menage of the vessel; danger from without was recognized and special watches set.

At 8 p. m., of February 15th, the usual and regular reports were made, indicating that all was well throughout the ship, and the crew and officers retired as usual. At 9:40 p. m. two explosions occurred; the first lifted the ship forward; the second produced most of the internal destruction; the protective and main decks were blown up, forward the smokestacks, and thrown aft and over to starboard, as is inferred, by the explosion of magazines. The keel and outer bottom plating of the ship is blown upward and inward, and now reaches, at one point, a height of over thirty feet above its original location, in the main line of the keel; this is considered to be due to the external explosion, and its evidence is taken as conclusive. This effect could only have been produced by the explosion of a mine, 'situated under the ship and on the port side.' The explosion of the magazines is considered to be the consequence of the primary explosion of the mine. No evidence was secured 'fixing the responsibility upon any person or persons.'

Many details of evidence are given which sustain the verdict of the Court; but the drawings themselves are perhaps the best proof that the ship herself, in her present position and condition, affords the best evidence, and most positive, regarding the source of the disaster. The bending upward of keel and bottom plating; the fact that all the lower positions of the ship, the lower and main decks, protective deck and frames, are forced upward and toward the starboard side; the complete breaking away of all the plating and the whole ship's side over a considerable area at the point at which the force of the explosion was felt; the distribution of the débris wholly toward the starboard side, and the non-existence of coal, or other material from the hold, on the port side of the ship; the location of the detached forward part of the vessel at right-angles with the original line of the keel; its separation and its relation to the uplifted keel—these and many other details appear in the evidence, and are shown by drawings made from measurement so fully as to afford, in the opinion of the experts constituting the Court and expert witnesses before it, sufficient proof to justify unqualified and positive statements regarding the nature of the explosion.

The report, happily, completely exonerates the officers and crew of the battleship; though, most unhappily, fails to fix the responsibility where it belongs, or to afford a clue to the authors of the catastrophe. This report, as a scientific discussion and a logical construction of proofs and conclusions, will always have more than historical interest, and it is very probable that the question: Who were the perpetrators of one of the most diabolical crimes of which history gives us an account? may forever remain unanswered.

R. H. THURSTON.

Birds of Village and Field: A Bird Book for Beginners. By FLORENCE A. MERRIAM. Boston and New York, Houghton, Mifflin & Company. The Riverside Press, Cambridge. 1898. Illustrated. 12mo. Pp. xlix+1–406. 28 half-tone plates and 220 cuts in text. Price, $2.00.

The ever-swelling stream of popular bird books is still further augmented by this attractive little volume which is possessed of a sparkle all its own as compared with several of its numerous competitors. The accuracy of the writer's statements and the breezy originality of her bits of bird biography commend her work to every bird lover be he scientifically or otherwise minded. The book is written for the otherwise minded, for the beginner, but as the Latin name, a few words of description and a mouthful of 'geographic distribution' precede each species mentioned, no one may justly complain that the scientific cravings of his nature are not stilled.

The introduction contains much about the economic value of birds to the farmer, and considerable stress is laid upon this matter elsewhere throughout the volume. It also contains a 'Field Color Key to adult spring males mentioned in this book,' and is followed by brief sketches of about one hundred and fifty common everyday species, such as one meets in eastern North America, including the Mississippi Valley. And, by the way, it seems to have been an oversight that no direct mention is made as to what section of the country is covered by the title. Following the sketches which make up the bulk of the volume is an

appendix containing a sample of the migration blank used by the U. S. Department of Agriculture; lists of migrants (with dates of arrival and departure) and winter birds at Washington, D. C., Portland, Conn., and St. Louis, Mo.; an 'Outline for Field Observations,' which is probably the most complete key as to the proper use to make of one's eyes in the field ever formulated; a list of the birds known to nest in Portland, Conn.; a list of books of reference; and a comprehensive index. The pages are profusely illustrated not only with half-tone plates and other figures of birds' heads, bills and feet, but also with figures of insects and plants to show the nature of the birds' food.

The book is remarkably free from errors, though I notice under Red-poll Warbler, at page 317, Illinois birds referred to the Eastern race and no notice at all taken of the Mississippi Valley race. Other criticisms resolve themselves chiefly into differences of opinion. Every book that deals with only part of the birds of a given locality and presents a key of male birds only and these in spring dress, without hint of rarer species that inconveniently pop up before even a beginner's eyes is necessarily a frail guide. It seems as if he ought to be warned of possibilities. He ought also to be warned not to take the 'law' of protective coloration (as cited at page 34, and elsewhere referred to) too seriously. There are numerous exceptions to it not as yet satisfactorily explained.

One feature of the book open to objection is the lack of arrangement of the species in any sort of order except that, as the writer confesses, 'the birds which readers are most likely to know and see are placed first, the rarer ones left until later.' This idea results in splitting up the Sparrows, the Vireos, the Woodpeckers and other groups so that some species are found in one part of the book and others, closely allied, in another, and after all we find such familiar birds as the Yellow Warbler, the Redstart, the Maryland Yellow-throat and the Oven-bird very close to the end, precedence being given to the Passenger Pigeon, the Pileated Woodpecker, the Snowy Owl and others less distinctly rare.

The press-work is excellent; the plates range from good to bad, one of the best being that of the Long-billed Marsh Wren at page 202; and the figures serve a useful purpose. The beginner might complain that the two sizes of cuts given in many cases (there are three different sizes of the cut of the Belted Kingfisher, pp. xix, 158 and 165) tend to confuse his ideas of relative size, but he should remember the illustrated alphabet of his first primer at school where 'cat' and 'horse' cover equal areas.

It would improve the volume if the comparisons and supplemental keys were set off from the species they follow. For instance, the sketch of Bachman's Sparrow at p. 242 apparently occupies several pages that are in no wise part of its biography.

Aside from these somewhat trivial imperfections there is little to criticise, and it is only a matter of regret that the biographies are not twice as long.

J. D., Jr.

SCIENTIFIC JOURNALS.

The *American Journal of Science* for May opens with an article by Mr. T. A. Jaggar, Jr., on 'Some Conditions affecting Geyser Eruptions.' There are other papers on geological and mineralogical topics, as follows: 'Determination of Plagioclase Feldspars in Rock Sections:' by Dr. G. F. Becker. 'Some Lava Flows of the Western Slope of the Sierra Nevada, California:' by Mr. F. L. Ransome. 'Krennerite, from Cripple Creek, Colorado:' by Professor A. H. Chester. 'Some New Jurassic Vertebrates from Wyoming:' by Professor W. C. Knight. 'Estimation of Manganese Separated as the Carbonate:' by Mr. M. Austin. The number also contains two important physical papers: 'Properties of Seasoned Magnets of Self-Hardening Steel:' by Professor B. O. Peirce; and 'Curious Inversion in the Wave Mechanism of the Electromagnetic Theory of Light:' by Professor C. Barus.

Terrestrial Magnetism for March opens with an illustrated article in French, giving a description of the new magnetic observatory at Parc Saint-Maur, near Paris, by M. Moureaux, the director of the observatory. As the old observ-

atory constructed in 1882, primarily for the purpose of taking part in the international scheme of observations of that period, was not especially adapted to the modern requirements of a magnetic observatory, a new building was erected on the same grounds and the old one set aside for special observations. A complete fifteen-year series has been obtained at the old observatory, and the registrations at the new observatory began on January 1st of this year. Unfortunately, at the very outset of its new career the observatory is menaced by the possibility of disturbance from electric cars which would pass 1,600 meters south of the observatory. Professor Cleveland Abbe contributes the first installment of an interesting article on 'The Attitude of the Aurora above the Earth's Surface.' His object is to collect some of the numerous observations, calculations and opinions bearing on the nature and the attitude of the auroral light. He therefore proceeds, in the present contribution, to give a chronological summary, beginning with Halley and ending with Young. Professor Schuster follows, writing: 'On the Investigation of Hidden Periodicities with Application to a supposed 26-Day Period of Meteorological Phenomena.' He undertakes to introduce scientific precision into the treatment of problems which involve hidden periodicities, and to apply the theory of probability in such a way that it may be possible to assign a definite number for the probability that the effects found by means of the usual methods are real, and not due to accident. An extract from Professor Rücker's recent lecture on 'Recent Researches on Terrestrial Magnetism,' exhibiting the intimate relationship between the geological and the magnetic constitution of Great Britain is next given. Mr. Putnam contributes an interesting 'Note in Regard to Magnetic Disturbances on St. George Island, Bering sea.' In a 'Letter to Editor,' W. van Bemmelen gives an account of his recent researches respecting old magnetic observations.

WE have received the number of the *Journal of the Institute of Jamaica* issued on the 28th of March. It contains an account of the meetings of the Institute—which includes literature and art as well as science—and a number of papers. Among these may be mentioned a life history of some Jamaica Hesperiidæ, by Mr. E. Stuart Pantin, which was awarded the Institute's prize for the most valuable research on the natural history of Jamaica. There is also a paper on the Actinaria of Jamaica, by Mr. J. E. Duerden, the curator of the museum of the Institute, who also contributes several science notes.

THE May *Century* contains several articles of scientific interest. It appears in a special cover, printed in gold and colors, after a design by Fernand Lungren, representing the great mesa of Katzímo. This is apropos of an article in the number by Mr. F. W. Hodge, of the Ethnological Bureau, describing his recent 'Ascent of the Enchanted Mesa.' Mr. Hodge gives the evidence he has discovered, already reported in this JOURNAL, for the truth of the old Ancoma tradition that the mesa was once the site of a Pueblo settlement. The article is illustrated from photographs and with pictures by Mr. Lungren, who also contributes a supplement article, 'Notes on Old Mesa Life.' Professor Trowbridge contributes an important article, illustrated from photographs, on the X-rays. Professor Louis Boutan, of the Sorbonne, gives an account of his successful experiments in 'Submarine Photography,' and there are reproductions of several photographs taken under the sea at various depths, including one made by artificial light. An article by Mr. Oscar Chrisman on 'The Secret Language of Childhood' is based on contributions made by him him to SCIENCE. Partly scientific in character are also the articles by Professor B. I. Wheeler on 'The Great Pyramids of Egypt,' and by Mr. F. B. Locke on 'Railway Crossings in Europe and America.'

THE *Annales d'électrobiologie d'électrothérapie et d'electrodiagnostic* is a new bi-monthly journal published since the beginning of the present year by M. Alcan, Paris, with Dr. E. Dourner, as editor-in-chief and an editorial committee including MM. d'Arsonwal, Tripier, Apostoli and Oudin. The two issues that have appeared extend the first volume to 286 pages, and contain numerous articles and full bibliographies. The subscription price for America is 28 fr.

THE issue of the New York *Independent* for

the present week is an African number. It contains a political-physical map of Africa printed in colors and numerous contributions by well-known writers, including Mr. Henry M. Stanley, Dr. Scott Keltie and others.

The May *Educational Review*, concluding the fifteenth volume, contains the following papers prepared for the Harvard Teachers' Association: The election of studies in secondary schools, five articles, as follows: 1. 'Its Effect upon the Colleges:' by Nathaniel S. Shaler. 2. 'Its Effect upon the Community:' by Samuel Thurber. 3. 'A Negative View:' by John Tetlow. 4 and 5. 'Affirmative Views:' by Charles W. Eliot and George H. Martin. 'The School Grade a Fiction:' by Wilbur S. Jackman; and 'Knowledge Through Association:' by T. L. Bolton and Ellen M. Haskell.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON—291ST. MEETING, SATURDAY, APRIL 9.

Mr. Vernon Bailey described the manner in which beavers fell trees, saying that they did not gnaw squarely across, but made two cuts a short distance apart vertically and pried out a chip between them. The result was a V-shaped cut very similar in appearance to that made by a wood cutter.

Professor O. P. Hay made some 'Observations on the genus of Cretaceous Fishes, called by Professor Cope *Portheus*,' discussing the osteology of the genus at some length and particularly the skull, shoulder girdle and vertebral column. He said that in many respects it resembled the Tarpon of our Southern coasts, although possessing widely different teeth, and undoubtedly belonged to the Isospondyli. The conclusion was reached that Cope's *Portheus* is identical with the earlier described genus *Xiphactinas* of Leidy. (Since the paper was read the author has learned that Professor Williston has reached the same conclusion.)

Mr. W. H. Osgood gave some 'Notes on the Natural History of the Farallon Islands,' dwelling particularly on the birds and illustrating his remarks with lantern slides. Mr. William Palmer presented a paper on 'A Phase of Feather Re-pigmentation,' briefly reviewing the discussion regarding this mooted question, stating that much of the discrepancy between the statements of the advocates and opponents of the subject was probably due to the geographical conditions under which their birds had been obtained. The theory was advanced that migration arrested the moult of birds, the drain upon their strength made by protracted flight preventing the growth of the new feathers and the shedding of the old.

F. A. Lucas,
Secretary.

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

The 276th regular meeting of the Society was held on Tuesday evening, April 5, 1898. Professor Otis T. Mason read a paper on 'Egypt in America.' He called attention to the early and insidious intrusion of the Iron Age into America everywhere, through the blonde Teuton, the dark-eyed Kelt and the melanchroic Spaniards and Portuguese. This time he confined the argument to the way in which much of the primitive life of Arabia, Palestine, Egypt and Northern Africa found its way to Latin America. Dr. Brinton, he said, had just emphasized the vast importance of North Africa and the Hamite (Khamite) in early civilization. Keane also had dwelt on this same subject in his late work, and Ripley was quoted as saying, "Beyond the Pyrenees begins Africa." The first settlers of Spain were Hamites, and they formed the folk of the peninsula during Keltic and Roman occupation. Phœnicia strengthened the bond with the mother race. Carthage went to Spain to claim her own, and for seven hundred years and more (711–1492) all the Semite-Hamite elements of the Moorish occupation were added to the old. It was this that furnished the folk life that came to middle America and easily and early affiliated itself with the natives. This folk life insidiously grows over the old, genuine, aboriginal culture and attracts the eye of the traveler who may have sojourned also in North Africa, Egypt or Palestine. By the trained eye it is easily detected and eliminated. For three thousand years the Khamites accultured Spain. In the

operative classes of all Spanish and Portuguese expeditions they crowded into the western hemisphere, and that is one way in which Egypt came to America. Discussed by Professor W J McGee.

Dr. Thomas Wilson read a paper entitled 'The Mysterious Chamber and the Magic Key.'

Mr. Isaac P. Noyes read a paper on 'The Peruvian Mummy.'

J. H. MCCORMICK,
Secretary.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 483d meeting of the Society was held at the Cosmos Club at 8 p. m. on April 16th. The first paper of the evening was by Mr. C. C. Yates on 'Personal Equation in Estimating Tenths.' The author stated that attention was first called to this equation by Pierce, in the Coast Survey Report for 1854. It was defined as a persistent deviation from the law of probability applied to the distribution of purely accidental estimates.

Mr. Yates illustrated this by diagrams representing equations obtained from readings of chronometers, micrometers, thermometers, levels, etc., involving, in all, 38,499 estimated tenths.

His conclusions from the study were that:

1. The personal equation in estimating makes its appearance in every species of observations involving an estimate.

2. It is the result of a defective habit or condition of the observer.

3. It can be more or less modified when attention has been called to it, except in its elements due to fixed conditions, such as astigmatism of the eye.

The second paper was by Mr. G. W. Littlehales on 'The Progress of Trans-oceanic Navigation in the 18th and 19th Centuries.'

The address described the extent of the influence of scientific work in the material affairs of mankind by pointing out what the investigators in astronomy, meteorology, mathematics, mechanics and physics have done during the last two centuries toward the improvement of navigation and the advancement of commerce on the sea.

Perhaps the striking progress in trans-oceanic navigation which the paper portrayed may best be reflected by these two sentences taken respectively from the former and the latter part:

"Driven by the variable winds—which were the sole motor of ocean commerce and of the fleets of nations in that age—and generally without other implements for navigation than the compass, log and line, it became the first duty of every captain to keep his ship in the company of others having the same general destination and thus to regulate his speed to the progress of the dullest sailor and the most indolent master in the fleet."

"A modern steamship works against time. Her paying qualities depend upon the celerity with which she can get from port to port, and her captain—generally disregarding the wind and weather upon which all depended in the old days, but mindful of the perils of navigation—chooses that course which offers the least number of miles of travel and upon which, if practicable, he can head his ship for the port of destination as if it were in sight throughout the voyage."

The third paper was read by Mr. W. H. Dall, in the absence of the author, Mr. Signe Rink. This interesting communication was 'On the Origin of the Eskimo Name for the White Man.'

E. D. PRESTON,
Secretary.

NEW YORK ACADEMY OF SCIENCES—SECTION OF BIOLOGY.

THE annual election of sectional officers resulted in the re-election of Professor E. B. Wilson and Mr. G. N. Calkins to the offices of Chairman and Secretary respectively.

Dr. O. C. Strong reported on a new point on the Innervation of the Lateral Line Organs, and the substance of his paper was as follows:

The view as to the innervation of the organs of the lateral line system which is upheld by the most recent investigations is that these organs are exclusively innervated by certain special roots, having a common center in the medulla. Certain exceptions have been recorded, however, which apparently militate against this view. One of these exceptions is the innervation of a certain canal organ by a

branch of the glossopharyngeus and thus apparently not by a lateral line nerve proper. This anomaly has been described in certain teleosts, ganoids and elasmobranchs.

In studying serial sections through the head of a young dog-fish (*Squalus acanthias*) a condition was found which not only explained this apparent exception, but converted it into an additional support for the specific character of the lateral line nerve roots. The lateral line nerve to the trunk and the glossopharyngeus emerge from the medulla in about the same transverse plane, the former being dorsal to the latter. Close to their exit from the medulla a small intracranial bundle of fibres becomes detached from the lateral line root and fuses with the glossopharyngeus. This bundle could be still followed as a component of the latter, however, owing to the greater caliber of its fibres. When the glossopharyngeus emerges from the auditory capsule the bundle in question soon becomes detached and could be traced to a canal organ. Undoubtedly the fibres, described by Kingsbury, which the glossopharyngeus in Amia receives from the root of the lateral line nerve, would be found to have a similar destination if traced in this way—as indeed Kingsbury himself has suggested.

H. E. Crampton,
Sec. pro. tem.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of the Academy of Science of St. Louis on April 18, 1898, eighteen persons present, Mr. Carl Kinsley read a paper on 'Series Dynamo Electric Machines.' He showed, by the results of tests of machines, that the relations between electromotive force, current and speed can be represented by a surface. This is easily done, since for widely different currents, and for both dynamos and motors, the total induced electromotive force is strictly proportional to the speed when the current is constant. He stated that Frölich's empirical equation can be used to represent large portions of this surface, as suggested by Professor F. E. Nipher.

It was stated that the way in which a series motor will operate from a series generator can be predetermined; and, for cases reported, it was shown that computed results throughout the complete range of working conditions gave an average agreement with observed results to within 0.05 per cent. The method explained in the paper enables an engineer to design such a power transmission circuit accurately from shop tests of the machinery, and to operate the series motor at constant speed under all loads.

It was shown that the resistance of the generator does not vary with the speed. This makes it possible to use a small series generator as a speed indicator and so obtain instantaneous values of engine speeds from the volt-meter or ammeter readings, if the resistance of the outside circuit is kept constant. The practicability of this methed of determining engine speeds was fully shown by the results reported in the paper.

Professor J. H. Kinealy made some informal remarks on the ventilation of schools, and by means of a number of stereopticon views showed the different methods adopted for supplying the air required to the different rooms of schoolhouses.

Four new members were elected.

William Trelease,
Recording Secretary.

NEW BOOKS.

Il Codice Atlantico. Leonardo Da Vinci. Milan, Ulrico Hoepli; New York, Gustav Stechert.

Studies of Good and Evil. Josiah Royce. New York, D. Appleton & Co. 1898. Pp. xv+384. $1.50.

Alternate Currents in Practice. Francis J. Moffett. London, Whittaker & Co.; New York, The Macmillan Company. 1898. Pp. ix + 376. $5.

Lectures on the Geometry of Position. Theodore Reyl; translated by T. F. Holgate. New York, The Macmillan Company. 1898. Part I. Pp. xix + 248. $2.25.

A Treatise on Magnetism and Electricity. Andrew Gray. London and New York, The Macmillan Co. 1898. Pp. xv + 947. $4.50.

The Development of the Child. Matthew Oppenheim. New York and London, The Macmillan Co. 1898. Pp. 296. $1.25.